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JOURNEYS OF THE PERSIAN BOUNDARY COMMISSION,

1870–71–72.

ZOOLOGY AND GEOLOGY

OF

EASTERN PERSIA.

EASTERN PERSIA

AN ACCOUNT OF THE

JOURNEYS OF THE PERSIAN BOUNDARY COMMISSION

1870-71-72

VOL. II

THE

ZOOLOGY AND GEOLOGY

BY

W. T. BLANFORD, A.R.S.M., F.R.S.

WITH NUMEROUS COLOURED ILLUSTRATIONS

Published by the Authority of the Government of India

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MACMILLAN AND CO.
1876

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[1] Named *Ablepharus pusillus* on the plate.

ZOOLOGY OF PERSIA.

INTRODUCTION.

THE materials from which the following partial sketch of the vertebrate fauna of Persia has been mainly derived are two collections,—the first made by Major St. John, with the assistance of a native collector sent from the Indian Museum in Calcutta, in the years 1869–70–71; the second that formed by myself with similar aid, whilst accompanying Major St. John in 1872 in his journey from Gwádar in Balúchistán to Shiráz, Isfahán, and Tehrán. To this collection also Major St. John contributed largely. The whole of the first collection, comprising more than five hundred specimens of birds and mammals, has been liberally entrusted to me by the Trustees of the Indian Museum for comparison and description. The reptiles collected by Major St. John have already been examined and described by Dr. Anderson, Curator of the Indian Museum[1], but I have had the advantage of comparing the types described by him, which have been sent to me for the purpose.

The specimens of fish and invertebrata being comparatively few in number, the present notes are chiefly confined to the four vertebrate classes of mammals, birds, reptiles, and amphibia. The united collections contain:—

	Species.	Specimens.
Mammalia	32	170
Aves	248	1236
Reptilia	62	597[2]
Amphibia	5	48[2]
Total	347	2051

Of the specimens obtained, by far the largest number were collected in Southern Persia and Balúchistán, the fauna of which was previously very little known, Northern Persia having hitherto received far more attention from European naturalists. The bulk of my own collection was obtained between Gwádar and Shiráz, although I procured many additions of interest during my journey from Shiráz to Tehrán, and in the Elburz mountains north of the capital. Major St. John's collection comprises a large number of specimens from the oak forest south and west of Shiráz, which I had not an opportunity of visiting. The majority of his bird skins are from the neighbourhood of Shiráz and the country between Shiráz and Bushire, but there are also several most interesting specimens from the hill ranges between Shiráz and Isfahán, from Tehrán and the Elburz mountains, and from the neighbourhood of the Caspian near Resht.

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[1] P. Z. S. 1872, pp. 371–404.

[2] Major St. John's collections not included.

The determination of the species collected has proved a long though an interesting task, and to the list formed I have added the names of all other species collected or observed by previous travellers in different parts of Persia, so as to give as complete an account as practicable of the whole Persian vertebrate fauna, with the exception of the class of fishes. All species not included in the collections made by Major St. John or myself are distinguished in the following lists by an asterisk before the name.

That the present is an extremely imperfect list of the mammals, birds, reptiles, and amphibians of Persia is certain. Enormous tracts of the country have never been explored by any zoologist. We are very imperfectly acquainted with the fauna of the plains extending from the Tigris to the base of the Zagros mountains, and we know still less of the animals inhabiting these mountains, the western slopes of which are covered with forests, and would doubtless furnish large additions to the list. North-eastern Persia too is zoologically almost a *terra incognita*, whilst the dense forests in Ghilán and Mazandarán, along the southern shore of the Caspian Sea, despite all the researches of Russian naturalists, have been so imperfectly explored that, even amongst the few species obtained by Major St. John and myself, there are several of which the existence in the country was previously unknown. It is scarcely probable, too, that a single journey through Balúchistán should have nearly exhausted the fauna of that province. Still, as the present is the first attempt which has been made to give anything like a complete list of the animals inhabiting the Persian territories, it is to be hoped that, however imperfect, it may be of some service in affording an idea of the zoology of Persia.

The territorial limits of the region to which the following pages refer are those of the present kingdom of Persia.' All animals known to inhabit Mesopotamia are included, because it is scarcely possible that any should be found on the Tigris and Euphrates which do not exist in the Persian portion of the plains east of those rivers; and similarly the wading and swimming birds of the Caspian are all comprised in the lists, because all of them are believed to be met with at times on the Persian coast. Several species, too, obtained by Ménétries and others at Lenkorán, are mentioned, because the locality named is only about ten miles distant from the Persian frontier, and is situated within the forest region of Ghilán and Mazandarán, so that it is extremely improbable that species found in the neighbourhood should not also occur within the Persian territory. I have also added the sea-birds noticed at Gwádar and elsewhere on the Balúchistán coast, although the localities are beyond the Persian boundary.

Before proceeding to a general sketch of the Persian fauna, it may be useful to point out succinctly what was known of it previously to the explorations of Major St. John and myself, and to enumerate the naturalists and travellers to whom we are indebted for a large portion of our information.

The first naturalist who explored a portion of the Persian fauna was S. G. Gmelin, frequently called the younger Gmelin, to distinguish him from J. G. Gmelin, the well-known compiler of the thirteenth edition of the Linnæan *Systema Naturæ*. S. G. Gmelin, who was one of a series of explorers employed by the Russian Government, travelled over a considerable portion of Ghilán and Mazandarán in 1770–71–72; he lived for some months at Enzeli, near Resht, and made collections of animals and plants; some of which were described by himself in the 'Reise durch Russland,' vols. iii. and iv. published in 1774 and 1784, others by Pallas. His collections, however, must have comprised but a small portion of the animals inhabiting those countries, and several of the species described by him as new belonged to forms well known previously. Pallas has corrected the names thus given in the introduction to the fourth volume of the 'Reise,' published after Gmelin's death in captivity; for the unfortunate explorer was made prisoner by a chief of the Caucasus, on a journey from Baku to Derbena, and died before he could be liberated.

Had Gmelin lived, he might probably have given to the world a fuller account of the fauna inhabiting the shores of the Caspian; the notes given in his diary are not only imperfect, but they are stated by Pallas to be occasionally incorrect, the locality of one or two animals being doubtful. I believe, however, that the greater portion of Gmelin's statements are trustworthy.

Pallas himself, in his journeys through the Asiatic possessions of Russia, only visited the northern extremity of the Caspian; and Güldenstadt appears to have confined his explorations to the Caucasus. Several notes on Persian animals, founded on specimens obtained by Gmelin and others, are, however, to be found in Pallas's great work the 'Zoographia Rosso-Asiatica,' first published as a whole in 1831, though printed at the beginning of the century. A few copies of the first volume were issued in 1811.

The next explorer who visited Persia and made zoological collections appears to have been Mons. G. A. Olivier, a member of the French Institute, who made a journey, by order of his Government, in 1796, from Bagdad to Isfahán and Tehrán. His only important acquisitions were a few species of reptiles, some of which were figured in his 'Voyage dans l'Empire Othoman, l'Égypte et la Perse,' published in 1807.

The two travellers next to be mentioned were both employed by the Russian Government, and the collections of both were made in the Caucasian provinces and on the shores of the Caspian. The first of these was E. Ménétries, who collected largely in different parts of the Caucasus in the years 1829 and 1830, and who penetrated as far as the Talish mountains in Persian territory south of Lenkorán, where he appears to have made considerable collections. Full lists of the animals obtained, with descriptions of several new species, were given in the 'Catalogue Raisonné des Objets de Zoologie recueillis dans un voyage au Caucause et jusqu'aux frontières actuelles de la Perse,' published at St. Petersburg, in 1832.

Another equally energetic naturalist was E. Eichwald, Professor of Natural History at Kazán, who in the years 1825–26 examined a large portion of the country bordering the Caspian. In the course of his voyages he touched at two or three places on the Persian coast, but at Enzeli he was prevented from landing by the Persian governor. An account of his travels was given in the 'Reise auf dem Caspischen Meere und in dem Caucasus' (published 1834–37), whilst the geological and zoological results of his explorations were given to the world in various works and papers in periodicals. By far the most important of his publications is the 'Fauna Caspio-Caucasia,' published at St. Petersburg in 1841. This work contains the most complete account hitherto published of the animals inhabiting the shores of the Caspian Sea, and to it, as well as to the work of Ménétries already quoted, numerous references will be found in the following pages, more especially in the part devoted to the Reptilia, many species of which are fully described and figured in Eichwald's work.

Aucher-Eloy, a French botanical collector, travelled, in 1835, from Bagdad by Hamadán to Isfahán, thence to Tehrán, and returned to Constantinople *via* Tabriz. In 1837–38 he again made a long journey through Persia, in the course of which he visited Shiráz, Bushire, and Bandar Abbás, and made a voyage to Maskat in Arabia. He penetrated into several places to which very few other Europeans have gone, such as the Bakhtiyari mountains and the ranges behind Maskat. He died at Isfahán in 1838. A collection, chiefly of reptiles, made by him, was purchased by the museum at Paris, and all the specimens are labelled Persia, and quoted as from that country in C. Duméril's 'Catalogue Méthodique de la Collection des Reptiles,' Musée d'Hist. Nat. Paris, 1851, but, although the most of the species are undoubtedly Persian, some, such as *Pseudopus Pallasii*, *Lacerta Taurica*, and *Chamæleo vulgaris* have never yet been found so far to the eastward; and as the specimens have in no case exact localities, I think it best not to include these species in the Persian fauna, although they may have been brought from Mesopotamia.

Belanger traversed Persia in 1825 on his way to India. The collections made by him, however, were mostly lost, and the only Persian specimen which reached Europe was a skin of the Sultaniah *Spermophilus*, which was described by Geoffry St. Hilaire in Belanger's 'Voyage aus Indes Orientales,' published in 1834.

Mr. W. K. Loftus, who was attached as Geologist to the Commission, which, in 1849-52, surveyed the frontiers between Turkey and Persia, brought back a small collection of zoological specimens which were made over to the British Museum. No complete list of the vertebrata has ever been published, and I am indebted to the kindness of Mr. Sharpe and Mr. Gerrard for calling my attention to the specimens, a few of which are mentioned in Dr. Gray's Catalogues.

A few reptiles and fishes were brought from Khorassan by Count

Keyserling, attached to the mission under Mons. N. de Khanikoff in 1858–59. Some of the more interesting of the reptiles have been described by Strauch, and the fishes by Count Keyserling himself. Some reptiles were also brought from Persia and deposited in the Vienna Museum by Dr. T. Kokschy, a botanical collector, like Aucher-Eloy. There are also small collections in the British Museum, made by Colonel Chesney, in Mesopotamia, during the progress of the Euphrates and Tigris Survey, and by the Hon. C. Murray, near Tehrán, and there is a collection of bird skins obtained by purchase in the same Museum, which, although labelled North Africa, Mr. Sharpe thinks, and I agree with him, are Persian. I am indebted to Mr. Sharpe for calling my attention to both the last named collections.

By far the most important contribution to a knowledge of the fauna inhabiting North-western Persia hitherto made is by Professor De Filippi, of Turin, who, in 1862, accompanied an Italian embassy to Persia. The route taken was from the Black Sea at Poti, *via* Tiflis, to Tabriz, thence by Kásvin to Tehrán, the embassy returning by Resht, the Caspian Sea, and Russia. Professor De Filippi made extensive collections and notes, both geological and zoological, and these were supplemented by the specimens procured by one of his companions, the Marquis Giacomo Doria, who extended his journey to Southern Persia and brought back a considerable number of interesting specimens, chiefly insects, reptiles, and fishes. A full account of De Filippi's journey and observations is given in his 'Note di un Viaggio in Persia,' published at Milan in 1865, in which, pp. 342–360, a complete list is given of all the vertebrata observed, consisting of thirty mammals, one hundred and sixty-seven birds, thirty-nine reptiles, three amphibia, and twenty-two fishes. Several of these, however, were only noticed in the Transcaucasian provinces beyond the Persian frontier. At page 363 a list of the land and freshwater mollusca procured from Persia, and determined by Professor Issel, is given. Many of the vertebrata mentioned by De Filippi appear to have been merely noticed by him, as no specimens exist in the Turin Museum, which I visited for the purpose of examining his collections.

Mr. Allan Hume made a large collection chiefly of sea birds on the coast of Balúchistán in February 1873, and published a full account of all species obtained there and in Sind, in an Indian ornithological journal edited by himself called 'Stray Feathers.' Mr. Hume did not land within the Persian territory, but he made a considerable collection at Gwádar, just outside the frontier.

Amongst other authorities to whom I am indebted for information as to the fauna of Persia, one of the most important is Professor Strauch, of St. Petersburg, whose exhaustive memoirs on various groups of reptilia and amphibia, published in the 'Mémoires de l'Académie Impériale des Sciences de St. Petersbourg,' contain much information as to Persian localities for the animals described. In Schmarda's 'Geographische Verbreitung der Thiere,' published in 1853, p. 408, is a list of Mesopotamian mammals, the authority for which is not given. The identification of some of the species appears to me rather doubtful. The list is quoted, with some alterations, by Murray, at p. 375 of his 'Geographical Distribution of Mammals.'

By the aid of the notes given by the various observers above enumerated, and by adding the names of those forms which were observed by Major St. John and myself, although no specimens were obtained, the list of animals known to inhabit Persia is considerably increased, and the following is a summary of the numbers belonging to the different orders of each class mentioned in the present work:—

MAMMALIA.		
Choiroptera	12	
Insectivora	5	
Carnivora	25	
Cetacea	1	
Rodentia	33	
Ungulata	13	
		89
AVES.		
Accipitres	42	
Insessores	196	
Columbæ	9	
Gallinæ	12	
Grallæ	53	
Gaviæ	22	
Pygopodes	4	
Herodiones	14	
Steganopodes	6	
Anseres	25	
		383
REPTILIA.		
Chelonia	5	
Lacertilia	53	
Ophidia	34	
		92
AMPHIBIA.		
Batrachia	7	
Urodela	2	
		9

For a full account of the physical geography of Persia I must refer to another part of this work. In this place it is sufficient to point out that the country consists of a number of desert plains, at various elevations of from about 1000 to 5000 feet above the sea, separated from each other, from the lower country to the east, north and west, and from the coast to the south, by ranges of mountains, varying much in height and breadth, but often of considerable elevation. Of the raised plains forming the principal part of Persia I shall often have occasion to speak, collectively, as the Persian plateau or highlands. This tract consists of plains and ranges of hills for the most part destitute of vegetation, agriculture being only possible where water can be obtained from springs or the small streams which descend from the higher ranges to lose themselves in the various deserts of the interior. Along the southern coast of the Caspian Sea is a damp region covered with dense forest, and the western slopes of the Zagros mountains, as already mentioned, are also wooded, though less thickly than the northern slopes of the Elburz. The Zagros belt of woodland extends south to the neighbourhood of Shiráz, where, from the prevalence of a species of oak, the tract is often spoken of as the oak forest. This tract is crossed on the road from Shiráz to Bushire, but it does not extend much farther to the south-east. There are, however, in the broken country extending along the shores of the Persian Gulf and Indian Ocean, and forming part of Fárs, Laristán, and Balúchistán, a few plains and valleys which support a rather thin forest, the trees being different from those of the Zagros and Shiráz forests, and consisting chiefly of tropical forms, among which tamarisk and mimosa (*Acacia Arabica* ?) are conspicuous. These comparatively fertile tracts are, however, seldom met with, the greater part of the country being as barren as the Persian highlands.

Owing chiefly to the physical features thus briefly alluded to, there is a great difference in the fauna of different parts of Persia, and the whole country may be divided into the following zoological sub-divisions:—

I. *The Persian province proper.* This consists of the plateau or highlands, and includes the greater portion of the country, comprising all the elevated plains in the interior of the country with the hills separating them from each other, and the inner slopes of the surrounding ranges.

II. *The Caspian provinces, Ghilán and Mazandarán.* These comprise the country along the southern shore of the Caspian, from Lenkorán to Astrabád, and from the sea coast to the limit of the forest on the slopes of the Elburz mountains, at an elevation of about 6000 to 7000 feet.

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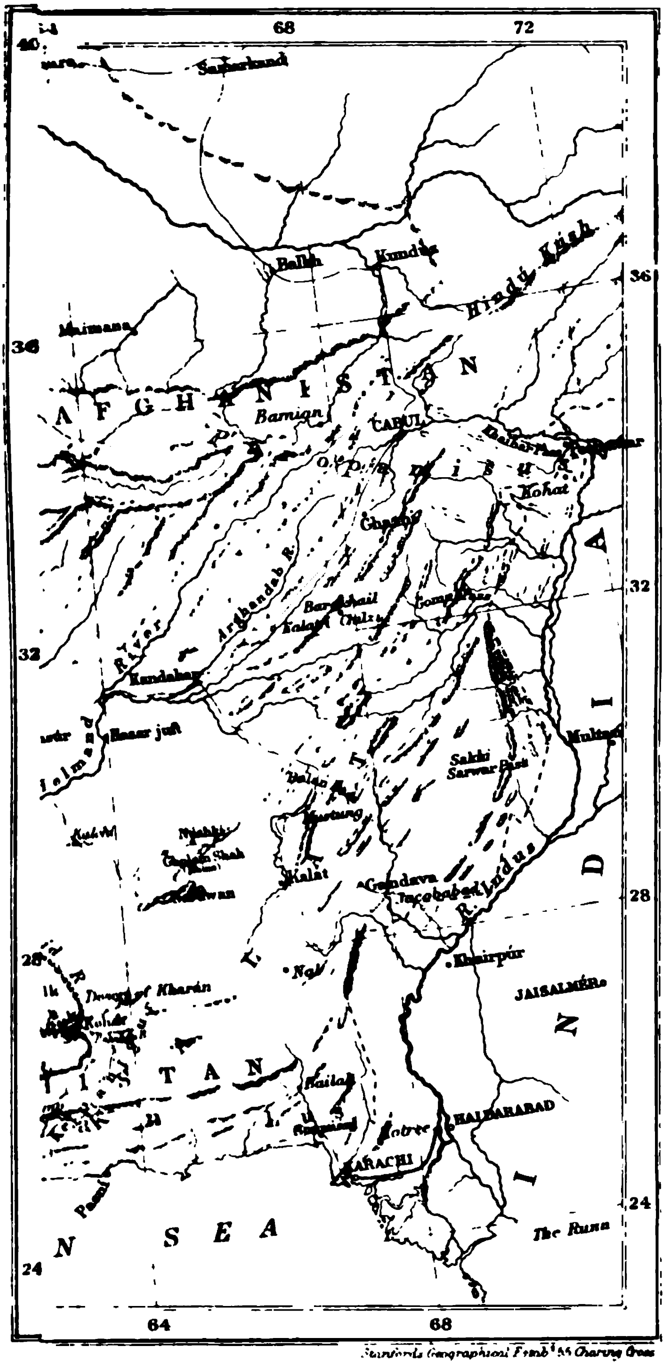

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III. *The wooded slopes of the Zagros,* including the oak forest near Shiráz, the only portion from which I have seen any collections of importance.

IV. *Persian Mesopotamia, being the eastern portion of the Tigris plain.* The whole plain, watered by the Tigris and Euphrates is, I think, usually spoken of as Mesopotamia, although the name, of course, originally applied only to the tract between the two rivers. From want of information, very little can be said of the fauna of this region, and perhaps it should be combined with the last.

V. *The lowlands on the shores of the Persian Gulf and Balúchistán,* up to an elevation of about 3000 feet above the sea.

Besides the above, the province of Adarbaiján, in North-western Persia, the fauna of which is similar to that of the Russian province of Transcaucasia, and includes several European forms not found farther to the south-east, might perhaps be distinguished. It forms a link between the Persian region and that of South-eastern Europe. There are a few species only found locally on the higher hills of Persia, e.g. *Spermophilus concolor*, *Lagomys rufescens*, *Arvicola mystacinus*, *Ovis Gmelini*, amongst mammals; *Montifringilla alpicola*, *Metoponia pusilla*, *Erythrospiza sanguinea*, *Passer montanus*, and *Tetraogallus Caspius*, amongst birds; and further exploration may increase the number so much as to involve the necessity of zoologically separating the tracts exceeding about 8000 feet above the sea from the remainder of the Persian highlands. But with the small amount of information available, I think it best to unite both Adarbaiján and the mountains with the province formed by the Persian plateau.

On the accompanying map an attempt has been made to give some idea of the limits of the different zoological provinces just named. It must, however, be remembered that not only is the information available very imperfect, but that the demarcation of exact boundaries for zoological subdivisions is always extremely difficult and usually impracticable, because the faunæ pass into each other along their margins and the limit of one characteristic form is not necessarily that of others. Thus of the species of birds characteristic of the Balúchistán region, some, as *Certhilauda desertorum*, appear never to be seen except on the plains close to the sea level, whilst others, as *Pratincola caprata*, are met with, not on the barren plains near the sea, but at an elevation of from 1000 to 3000 feet in the better wooded valleys; others again, as *Pycnonotus leucotis*, are found both near the sea and at all levels up to 5000 or 6000 feet, where they mix with Palæarctic forms, which do not appear below the plateau. Yet all these species are equally typical of the particular province along the sea coast, none of them extending any distance northward on the plateau.

In order to show the distinctions of the zoological provinces enumerated, it will be necessary to enter into a few details, and to mention some of the species characteristic of each. The species peculiar to Persia are few in number, but there are several which from their abundance give a distinct character to the fauna.

I. *Persian plateau or highlands.* This occupies by far the greater portion of the country, and the animals inhabiting it form the typical Persian fauna, the other provinces being for the most part portions of neighbouring regions. The majority of the species inhabiting the Persian highlands are Palæarctic forms, and the whole country may perhaps be included in the great Palæarctic region; but still there is a great prevalence of the peculiar types characteristic of the barren tracts of Northern Africa and Central Asia, many of which have rather African than Palæarctic affinities, and which are generally spoken of as desert forms. Such are, amongst mammals, species of *Gerbillus* and *Gazella;* amongst birds, forms of *Saxicola*, *Ammomanes*, *Pterocles* and *Caccabis*, and especially *Gyps fulvus*, *Buteo ferox*, *Saxicola deserti*, *Sylvia nana*, *Bucanetes githagineus*, *Ammoperdix Bonhami*, etc.; whilst desert types of reptiles are well illustrated by species of *Agama*, *Trapelus*, *Phrynocephalus*, *Uromastix* (*Centrotrachelus*), *Eremias*, *Mesalina*, *Eryx*, *Zamenis*, *Psammophis*, *Cerastes*, and *Echis*.

As might be anticipated, many of the Persian species are forms characteristic of the fauna of Central Asia, the following being a few of the most important:—

MAMMALIA.

Erinaceus macracanthus.
Felis uncia.
F. chaus.
Spermophilus concolor (only known from parts of Northern Persia).
Cricetus phæus.
Alactaga Indica.
Equus onager.
Ovis cycloceros.

AVES.

Ruticilla erythronota.
Daulias Hafizi.
Cinclus Cashmirensis.
Metoponia pusilla.
Erythrospiza obsoleta.

REPTILIA.

Phrynocephalus, three species.
Eremias Persica.
Taphrometopon lineolatum.

Some of the above, e.g. *Erinaceus macracanthus*, *Ovis cycloceros*, and *Eremias Persica* are not found in Central Asia, but they are represented by closely allied forms.

The following are some of those species which are most characteristic of the Persian fauna. Species peculiar to Persia are marked with an asterisk.

MAMMALIA.

Felis pardus.
F. chaus.
Canis lupus.
Hyæna striata.
Ursus Syriacus.
*Erinaceus macracanthus.
*Vulpes Persicus.
*Meles canescens.
Mus Bactrianus.
Cricetus phæus.
*Gerbillus Persicus.
Equus onager.
Sus scrofa.
Ovis cycloceros.
Capra ægagrus.
*Gazella subgutturosa.

AVES.

Gyps fulvus.
Gypaëtus barbatus.
Neophron percnopterus.
Buteo ferox.
Scops giu.
Athene glaux.
Merops apiaster.
Coracias garrula.
Cypselus apus.
Caprimulgus Europæus.
Picus Syriacus.
Lanius minor.
Muscicapa grisola.
Saxicola isabellina.
S. picata.
Monticola saxatilis.
Daulias Hafizi.
Hypolais rama.
Aëdon familiaris.
Parus major.
Hirundo rustica.
Chelidon urbica.
Oriolus galbula.
Motacilla alba.
M. personata, var.
Galerita cristata.
Otocorys penicillata.
Calendrella brachydactyla.
Melanocorypha calandra.
M. bimaculata.
Carduelis elegans.
Bucanetes githagineus.
Passer Indicus.
Petronia brachydactyla.
Emberiza Huttoni.
Euspiza melanocephala.
Corvus corax.
C. cornix.
Pica rustica.
Sturnus vulgaris.
Columba livia
Turtur auritus.
Pterocles arenarius.
Ammoperdix Bonhami.
Caccabis saxatilis.
Houbara Macqueenii.
Cursorius gallicus.

Reptilia.

Testudo ibera.
Agama agilis.
Trapelus ruderatus.
*Phrynocephalus Olivieri.
*P. maculatus.
Ophiops elegans.
*Eremias Persica.
Mesalina pardalis.
Eumeces auratus.
Eryx jaculus.
Zamenis diadema.
Z. ventrimaculatus.
Z. Ravergieri.
Tropidonotus hydrus.

Amphibia.

Rana esculenta.
Bufo viridis.

I have omitted the wading and swimming birds, as a rule, because they are rarely characteristic, and, on the barren Persian plateau, they are not often seen.

The following forms are also peculiar or unusually abundant, but, so far as is known, they are not generally distributed throughout the highlands:—

Mammalia.

*Triænops Persicus (only known from Shiráz).
*Vesperus Shiraziensis (only known from Shiráz).
*V. mirza (only known from North-western Persia).
*Spermophilus concolor (parts of Northern Persia).
Gerbillus erythrurus (neighbourhood of Shiráz).
Lagomys rufescens (mountains north of Isfahán).

Aves.

Saxicola deserti (Southern Persia).
Acrocephalus stentoreus (Southern Persia).
Cotyle (Ptyonoprogne) rupestris (higher ranges only).
*Sitta rupicola (hill ranges of Northern Persia).
Emberiza miliaria (only common in the north).
Pyrrhocorax graculus (local).

Reptilia.

*Stellio nuptus (Southern and Central Persia).
*S. microlepis (higher ranges of Southern Persia).
*S. Caucasicus (ranges of North-western Persia).
*Phrynocephalus Persicus (Northern Persia, and high plains farther south).
*Agamura Persica (Southern Persia).
*Lacerta princeps (east of Shiráz).
*Eremias fasciata (South-east Persia).
*Zygnopsis brevipes (South-east Persia).
*Typhlops Persicus (South-east Persia).
*Dipsas rhinopoma (South-east Persia).

On the whole, the fauna of the Persian plateau may be briefly described as Palæarctic with a great prevalence of desert forms, or, perhaps more correctly, as being of the desert type with Palæarctic species in the more fertile regions[1].

II. *The Caspian provinces, Ghilán and Mazandarán.* It has already been mentioned that these districts, lying along the south coast of the Caspian Sea, possess a humid climate, and are covered by dense forest. Their fauna is on the whole decidedly Palæarctic, most of the animals found being identical with those of South-eastern Europe. But although the zoology is very little known, there are some peculiar species indigenous, and the number may be much increased by further search, whilst a rather singular character is given to the fauna by the presence of certain Eastern forms, unknown in other parts of Persia, such as the tiger, a remarkable deer of the Indo-Malayan group allied to *Cervus axis*, and a pit viper (*Halys*). The following are characteristic animals:—

MAMMALIA.

Talpa Europæa.
*Sorex pusillus.
*S. Gmelini.
Felis tigris
Canis aureus.
Mus sylvaticus.
*Arvicola mystacinus.
*Arvicola socialis.
Cervus maral.
*C. Caspius.
Capreolus caprea.

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[1] It is still a moot point amongst naturalists whether they shall recognise a desert zoological province or not. The truth is that the characteristic desert forms, as *Gazella*, *Gerbillus*, *Dipus*; *Gyps* (*fulvus* and its allies), *Buteo* (*ferox* and some other species), certain larks and stonechats, *Bucanetes*, *Pterocles*, *Ammoperdix*, *Houbara*, and some other bustards, *Cursorius* and *Struthio*; *Agama*, *Eremias*, *Acanthodactylus*, *Echis*, *Psammophis*, etc., rarely occupy any country exclusively. They prevail throughout the great dry belt which occupies all Northern Africa, South-eastern and Central Asia; but everywhere in the Northern portion of the belt, and throughout Central Asia, a mixture of Palæarctic forms is to be found occupying every fertile oasis, whilst in Central and Southern Africa Ethiopian species are intermingled with the desert types, and in India, Indo-African and Indo-Malay forms. Thus it appears as if there were no true desert province, though there is, I believe, a true desert fauna; and this fauna occupies the border land between the Palæarctic region on the one hand, and the Indian and Ethiopian regions on the other. I think also that the relations of the principal desert types are with species restricted amongst existing forms to the African fauna. Thus in the genus *Gazella*, one of the best marked and most typical of desert haunting mammalian genera, the great bulk of the species (of which a monograph by Sir Victor Brooke has lately been given P. Z. S. 1873, p. 535), are found in Northern Africa and South-eastern Asia, whilst slightly aberrant forms of the *G. gutturosa* type extend throughout Central Asia; and another aberrant group, that of *G. dama*, *G. Sœmmeringi*, *G. Granti*, and *G. mohr*, inhabits Eastern, North-eastern, and Western Africa, the most aberrant of all being *G. euchore*, the springbok of South Africa. So with existing wild forms of *Equus*, represented by the zebras of Africa. So with *Pterocles*, *Eremias*, etc.

Aves.

Picus Syriacus.
Gecinus canus.
Turdus musicus.
T. iliacus.
*Erythacus Hyrcanus.
Sylvia conspicillata.
Acredula tephronota.
Sitta cæsia.

Anthus Richardi.
Fringilla cœlebs.
Coccothraustes vulgaris.
Passer domesticus.
*Garrulus Hyrcanus.
Phasianus Colchicus.
Francolinus vulgaris.
Porphyrio veterum.

Reptilia.

Emys orbicularis.
Lacerta muralis.
*Anguis orientalis.

Typhlops vermicularis.
Tropidonotus natrix.
Halys Pallasii.

Amphibia.

Rana temporaria.
Hyla arborea.
Bufo vulgaris.

*Triton Karelinii.
*T. longipes.

As before, animals marked with an asterisk have not hitherto been met with out of Persia.

III. *The wooded slopes of the Zagros, including the oak forest near Shiráz.* The fauna of this tract is even less known than that of the Caspian forests; indeed, almost all our knowledge of it is derived from Major St. John's collections near Shiráz. It appears much to resemble that last described, and perhaps further research may show that the two should be united; but, at present, our only knowledge of the two faunæ being derived from localities separated by eight degrees of latitude, it appears best to class them apart. So far as known, the Zagros mountains, like the northern slopes of the Elburz, have a Palæarctic fauna with a few peculiar species. The following are the most characteristic animals:—

Mammalia.

Felis leo.

*Sciurus fulvus.

Aves.

*Picus Sancti Johannis.
Gecinus viridis.
Turdus musicus.
*Parus phæonotus.
*Cyanistes Persicus.

Acredula sp.
Troglodytes parvulus.
Fringilla cœlebs.
Garrulus atricapillus.
Columba casiotis.

IV. *Persian Mesopotamia.* This apparently much resembles Syria in its fauna, and belongs to the same subdivision of the Palæarctic region, but so little is known accurately of the animals that I can scarcely furnish a list of characteristic forms. Amongst mammals, *Felis leo*, **Herpestes Persicus*, *Gerbillus tæniurus*, **Dipus Loftusi*, *Sus scrofa*, *Gazella dorcas*, and two kinds of deer, one of which is *Cervus dama*, are found; amongst the birds, there is no form known worthy of notice, whilst amongst the reptilia are *Clemmys Caspia*, **Trionyx Euphraticus*, *Uromastyx microlepis*, *Trapelus ruderatus*, *Ophiops meizolepis*, **Ablepharus pusillus*, *Cyclophis modestus*, *Rana esculenta*, and *Hyla arborea*.

V. *Balúchistán and the shores of the Persian Gulf.* The animals of this region differ widely from those of the rest of Persia. Throughout all other parts of the country Palæarctic forms prevail, but in the hot regions, on the shores of the Indian Ocean and Persian Gulf, the animals which are common to the Persian highlands are for the most part desert types, whilst the characteristic Palæarctic species almost entirely disappear, their place being taken by Indian or Indo-African forms. Many of the birds ascend a short distance on the southern portion of the highlands in summer, and may be found about Shiráz, Karmán, etc., but the majority do not appear to range further north. The following are some of the principal species found:—

MAMMALIA.

Cynonicterus amplexicaudatus.
Pipistrellus leucotis.
Felis pardus.
Sciurus palmarum.
Mus Bactrianus.
Nesokia Huttoni.
Gerbillus Indicus.
G. Hurrianæ.
*G. nauus.
*Lepus craspedotis.
Gazella Bennetti.

AVES.

Butastur teesa.
Buteo ferox.
Athene Brama.
Merops viridis.
Caprimulgus Ægyptius.
C. Mahrattensis.
Picus Sindianus.
Lanius lahtora.
L. vittatus.
L. isabellinus.
Pratincola caprata.
Saxicola monacha.
Sylvia curruca.
Phylloscopus tristis.
Crateropus Huttoni.
Drymœca gracilis.
Cotyle obsoleta.
Pycnonotus leucotis.
*Nectarinia brevirostris.
Certhilauda desertorum.
Pyrrhulauda melanauchen.
Gymnoris flavicollis.
Emberiza striolata.
Corvus umbrinus.
Acridotheres tristis.
Turtur risorius.
T. Cambayensis.
Pterocles Senegallus.
Francolinus vulgaris.
Ortygornis Ponticeriana.

Reptilia.

Calotes versicolor.
Agama agilis.
*Stellio liratus.
*Centrotrachelus loricatus.
Hemidactylus, two or three species.
*Bunopus tuberculatus.
*Ceramodactylus Doriæ.
*Agamura cruralis.
Varanus dracæna.
Acanthodactylus Cantoris.
*A. micropholis.
*Sphalerosophis microlepis
Psammophis Leithii.
Echis carinata.

Amphibia.

Rana cyanophlyctis.
*Bufo olivaceus.

A glance at the above list will show that the majority of the Indian forms are those which inhabit the dry parts of India, and have desert affinities, e.g. *Gerbillus Indicus*, *G. Hurrianæ*, *Gazella Bennetti*, *Caprimulgus Mahrattensis*, *Lanius lahtora*, *Gymnoris flavicollis*, *Ortygornis Ponticeriana*, etc., but mingled with them are four species, *Cynonicterus amplexicaudatus*, *Butastur teesa*, *Pratincola caprata*, and *Calotes versicolor*, which range east of India into the Malay countries. The first is probably a species frequenting the sea shore, but the other three appear to be Malay forms which have extended their range farther west than any others. *Pratincola caprata* is represented by a closely allied species of the same genus, *P. semitorquata* Heugl., in Abyssinia; *Butastur teesa* is similarly represented by the North-east African *B. rufipennis;* but I know of no African ally of *Calotes versicolor.*

A few forms are African, and they are either unknown in India, or else do not extend farther east than Sind and the neighbouring districts east of the Indus. Such are:—

Caprimulgus Ægyptius.
Lanius isabellinus.
Saxicola monacha.
Cotyle obsoleta.
Certhilauda desertorum.
Pyrrhulauda melanauchen.
Corvus umbrinus.

And amongst reptiles the genus *Acanthodactylus*. All of these are desert types.

Just as the fauna of the Persian plateau has been briefly characterised as of the desert type with a large admixture of Palæarctic forms, that of Balúchistán and the shores of the Persian Gulf may be described as being desert with a small admixture of Indian species.

In concluding these introductory remarks, it only remains for me to add that I am indebted to Major St. John for far more assistance in the preparation of the present work than appears from the occasional mention of information received from him. He has made notes of the fauna of Persia, especially of the birds, for several years, and has most liberally allowed me to make use of all the information thus acquired. I am also indebted to him for most of the Persian names given for the animals.

My thanks are also due to Dr. Günther, Mr. Dresser, Lord Walden, Professor Newton, Dr. Sclater, Messrs. Dobson, Sharpe, Harting, Howard Saunders, Tristram, Gurney, and Alston, for aid of every kind in determining my collections, and abroad to Professor Peters, and Dr. Cabanis, of Berlin; Count Salvadori, of Turin, and Marquis G. Doria, of Genoa. To all these gentlemen I am indebted for assistance in the identification of the more difficult species, loan of specimens, and access to their collections.

NOTE.—Species marked in the following pages with an asterisk thus, * *Rhinolophus ferrum equinum*, are not represented in the collections made by Major St. John and myself; of the specimens obtained by us, lists, with the exact localities and their elevation above the sea, are given under each species immediately after the synonomy, and, with birds, the date on which each was shot is added, if known. Names of species with De F. after them are included in De Filippi's list, the names used by him being, as a rule, only quoted when they differ from my own. The notes signed O. St. J. are by Major St. John. When a note of interrogation is prefixed, the occurrence of the species is considered doubtful.

MAMMALIA.

THE mammalia fauna of Persia is not very rich. The following pages contain an enumeration of only eighty-nine species.

The *Quadrumana*, *Proboscidea*, *Hyracoidea*, and *Edentata* are not represented within our area, although species belonging to all of them are found in neighbouring countries.

CHEIROPTERA.

For all the identifications of the few bats obtained by Major St. John and myself, I am indebted to Mr. G. E. Dobson, who has examined all, and described the new species from both collections. He has called my attention to the generally pale and sandy colouration of the Persian bats, as well as of those inhabiting North-western India, and I shall frequently have occasion to point out that the same observation may be applied to several Persian mammals and birds.

FAMILY PTEROPIDÆ.

1. **Cynonycteris amplexicaudata,** (Geoff.)

Dobson, Jour. As. Soc. Bengal, xli, 1872, pt. ii, p. 154, xlii, 1873, p. 202; Proc. A. S. B. 1873, p. 110.

I found this species abundant in caves excavated in rock salt at a spot called Namakdún, on the south coast of the island of Kishm, in the Persian Gulf.

The occurrence of this Malay form so far to the west is rather surprising, although similar examples are to be found amongst birds and reptiles. But Mr. Dobson points out, Proc. A. S. B. 1873, p. 200, note, that he believes *Cynonycteris* to be a cave haunting species, living sometimes on mollusca left exposed by the tide on the sea coast, and it may thus range, as do other marine animals, along the sea shore, independently of the general distribution of the terrestrial fauna.

The circumstance of this bat living on mollusca explains the occurrence of a species belonging to the *Pteropidæ* in so dreary a desert as the island of Kishm, where a fruit-eating bat could scarcely exist.

FAMILY RHINOLOPHIDÆ.

2. ***Rhinolophus ferrum-equinum** ? (Schreber.)

Vespertilio hippocrepis, Pall. Zoogr. Ros. As. i, p. 125.

According to Pallas, l. c., this bat was obtained by S. G. Gmelin in the Elburz, and Murray includes the species in his list of mammals inhabiting Mesopotamia (Geogr. Dist. Mam. p. 375). He quotes the list from Schmarda, who, however (Geog. Verbr. Th. p. 408) only gives *Rhinoloph. spec. indet.* This species has a wide range throughout the Palæarctic regions, extending from England to Nipal (Dobson in Proc. As. Soc. Beng. Dec. 1872).

3. **Triænops Persicus,** Dobson.

J. A. S. B. xl, 1871, pt. ii, p. 455, and xli, 1872, pt. ii, p. 136.

The types of this species were obtained at Shiráz by Major St. John, at an elevation of 4750 feet above the sea. When at Shiráz I shot all the bats I could, but I did not succeed in obtaining additional specimens.

[All the specimens of this new bat were shot the same evening, in May, just outside the walls of Shiráz. I have not seen it elsewhere.—O. St. J.]

FAMILY VESPERTILIONIDÆ.

4. **Vespertilio murinus**, Schreb.

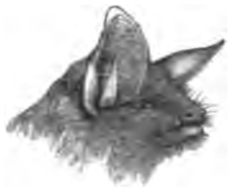
This was included in the collection made by Major St. John in Shiráz, in 1870. (Dobson, J. A. S. B. xl, pt. ii, p. 461.)

5. **Vespertilio desertorum**, Dobson, sp. nov.

1-9. Jálk, Balúchistán	3000

V. *fusco-fulvus, auribus magnis, ad apices rotundatis, margine exteriore juxta apicem emarginatá, inde ad basin tragi rectá, conchá punctis glandularibus confertim instructá; trago longo, angusto, acuto, margine interiore convexiusculá, exteriore concavá; digitis tertio quartoque fere æqualibus, vertebrá ultimá caudæ membranam excedente; alis a basi digitorum pedum orientibus. Long. corporis cum capite* 2.1, *caudæ* 1.65, *auris* 0.65, *tragi* 0.35, *radii* 1.65, *tibiæ* 0.8, *poll. Angl.*

Hab. ad Jálk, Balúchistán.



Head of *Vespertilio desertorum*, nat. size.

Ears large with rounded tips; outer side deeply emarginate beneath the tip, then forming a straight line without interruption to its termination in front of the base of the tragus; the conch is covered with glandular dots, as in *V. picta*. Tragus long (the tip reaching almost as far as the deepest part of the emargination on the outer side of the ear), narrow and acutely pointed, inner margin slightly convex, outer correspondingly concave.

The third and fourth fingers are almost equal in length, the fourth usually slightly the longest. Last vertebra of tail half free. Wings from the base of the toes.

Fur moderately long and dense; hairs dark at the base for a short distance, then pale straw colour, tips light brown; ears pale brownish-yellow; membranes light-brown.

The fur extends thickly upon the face as far as a point corresponding to the upper canine; the interfemoral is covered as far as a line drawn at right angles to the distal extremity of the third caudal vertebra, a few straggling hairs only extending beyond this; the tibiæ are thinly clothed, the ankles and backs of the feet are naked, but some hairs reappear on the backs of the toes.

Upper incisors, on each side, parallel to each other and not separated at their extremities, equal in length, and separated by a narrow interval from the canine; second upper pre-molar minute, much smaller than the first, and placed in a line slightly internal to it and the third pre-molar.

Length, head and body, 2.1 inches; tail, 1.65; head, 0.75; ear, 0.65; breadth of ear, 0.4; length of tragus, 0.35; greatest breadth, 0.1; length of forearm 1.65; thumb, 0.35; second finger, 2.8; third finger, 2.2; fourth finger, 2.2; tibia, 0.8; calcaneum, 0.55; foot and claws, 0.4.

The above description is by Mr. Dobson. I can add nothing as to the habits of this bat, several specimens of which were brought to me at Jálk. I met with it at no other locality.

6. ***Vesperus serotinus,** (Schreb.).—De F.

Vespertilio Turcomanus, Evers., De F. Viag. in Persia, p. 343.

The serotine is recorded by Ménétries from the Tálish mountains near Lankorán. De Filippi obtained *V. Turcomanus* at Sarchám and Zinján on the road from Tabriz to Kazvín, and a specimen is preserved in the Turin Museum. Mr. Dobson informs me that he has ascertained without doubt that *V. Turcomanus* is identical with the serotine. He also doubts if the two species next named should be kept distinct from *V. serotinus*.

7. **V. Shiraziensis,** Dobson.

J. A. S. B. xl, 1871, pt. ii, p. 459.

1-5. Shiráz	4500

It is just possible that this may be the same as the next, but it is impossible to identify it with De Filippi's description; the measurements do not coincide well, and the muzzle in *V. Shiraziensis* is not elongate, as it is said to be in *V. mirza*.

I found this bat abundant close to Shiráz. I shot several in the evening just outside the city.

8. *V. Mirza, De F.

Vespertilio (*Vesperus*) *mirza*, De F. Arch. per la Zool. Genova, ii, p. 380; Viag. in Persia, p. 342.
? *Vespertilio serotinus*, Mén. Cat. Rais. p. 17, note.

This bat is said to be allied to the serotine of Europe, but to have a longer snout, the length from the angle of the ear to the point of the nose being greater than the height of the ear, whereas in the serotine it is nearly the same. Its colour is thus described: '*Supra cofeino-grisescens, vellere longo, nitore sericeo, subtus griseo-fulvus; alis et auriculis aterrimis*,' (l. c.)

The colouration of bats has been shown by Dobson to be very variable and of small importance in the determination of species. As to the value of the difference in the form of the head, everything depends upon whether De Filippi compared either fresh specimens or the skulls of the two species, or whether he drew up his description solely from the dried skin which exists as the type in the Turin Museum. This I have examined. The nose certainly appears considerably longer than in the serotine, but without extracting the skull I cannot say whether there is any real distinction or whether the apparent difference is merely due to the mode of mounting.

The following measurements are given by De Filippi, but it is again unfortunately not stated whether they are taken from the fresh animal or the dried skin. In the latter case none are of any use, except perhaps the first.

		Metre.		Inches.
From the elbow to the point of the extended wing	..	0.135	or	5.25
From one elbow to the other, with the wings extended	..	0.076	,,	3
From the anus to the muzzle	..	0.085	,,	3.35
From the angle of the ear to the point of the nose	..	0.021	,,	0.83
Height of the ear	..	0.015	,,	0.6

V. mirza was obtained by De Filippi at Zinján and Kazvín, northwest of Tehrán.

9. Vesperugo (*Pipistrellus*) marginatus, (Rüpp.)—De F.

Brought from Southern Persia by Doria, and procured at Shiráz by Major St. John.

10. V. (*P.*) Coromandelicus, (F. Cuv.)

This species also was obtained at Shiráz by Major St. John (Dobson, J. A. S. B. xl, 1871, pt. ii, p. 461).

11. V. (*P.*) leucotis, Dobson.

J. A. S. B. xli, pt. ii, p. 222.

1.	Bampúr, Balúchistán	1800
2, 3.	Karmán, S. E. Persia	5000
4.	Niríz, east of Shiráz	5000
5–8.	Southern Persia, (labels illegible).	

All the small bats obtained by me in Southern Persia appear to belong to this species, which is distinguished by its minute outer incisors in the upper jaw, and by the lower incisors being simple, not trilobate.

The following were the dimensions, taken immediately after death, of a pair shot at Karmán:—

	Male. In.	Female. In.
Length from nose to tip of tail	3.3	3
Extent from end to end of wings	9	8.7
Length of tail from anus	1.5	1.45
Length of radius	1.36	1.22
Length of tibia	0.47	0.48

12. *Plecotus auritus, L.

This is said by Peters (Monatsber. Ak. Wiss. Berl. 1866, p. 18) to have been collected in Persia by the Prussian Envoy, Von Minutoli. No precise locality is given.

Vesperugo noctula and the pipistrelle (*V. pipistrellus*) are said by Eichwald to be found in the Caucasus and Transcaucasian provinces of Russia, and they probably inhabit North-western Persia. *Barbastellus communis* also, which ranges from Europe to the Himalayas, may occur within Persian limits.

Brief descriptions are given by Ménétries (Cat. Rais. p. 17, note) of three species of bats obtained by him, two in the Tálish mountains, the third in caravanserais on the shores of the Caspian, but he only identifies one (*V. serotinus*), and that doubtfully.

INSECTIVORA.

Family TALPIDÆ.

13. *Talpa Europæa, L.

According to Ménétries, the European mole is found at Lankorán. Eichwald records its occurrence in the Caucasus, and it extends through Central Asia to Siberia, but it has not been observed on the Persian highlands.

[I have never seen indications of moles' burrows anywhere in Persia. —O. St. J.]

Family SORICIDÆ.

14. *Crocidura fumigata, De F.

> *Sorex* (*Crocidura*) *fumigatus*, De F. Arch. per la Zool. Genova, ii, p. 379; Viag. in Persia, p. 343.

The following is De Filippi's description of this species :—

'S. *cauda elongata, crassa, inter pilos procumbentes setis longissimis verticillatim dispositis. In regione mento-jugulari, utroque latere, verrucis piliferis quatuor. Supra fusco-plumbeus, subtus cinereus.*'

'Allied to *S. araneus*[1], but distinguished by its colour, by the first false molar being proportionally more developed, and by its much longer tail, as appears from the following comparison :—

		Metre.		Eng. In.
S. araneus.	Length of body	.071	or	2.8
„	Length of tail	.034	„	1.35
S. fumigatus.	Length of body	.062	„	2.45
„	Length of tail	.042	„	1.65

'Another character, only to be detected in specimens preserved in spirit, consists in the presence in this species along the lower jaw, on each side of the mento-gular region, of four small prominences, each bearing a long hair.

'The description given by Pallas (Zoographia Rosso-Asiatica) of

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[1] It should be borne in mind that, according to the British Association rules of nomenclature, the shrew commonly known as *Sorex vulgaris* is the real *S. araneus*, being thus named in the 12th edition of Linnæus. The correct name for *Sorex* (*Crocidura*) *araneus* auct. appears to be *S. russulus*, Zimmerman.

S. Guldenstædtii might also agree with the present species, which, however, has the ears so distinctly developed, that the phrase "*auriculi vix e vellere emergentes*" cannot be applied to it. Moreover, if *S. Guldenstædtii* so nearly resembles *S. leucodon*, as to form with this latter one species (Giebel, Die Säugethiere, p. 902) then the differences from *S. fumigatus* would be greater.'

I examined the types of this species in the Turin Museum. There are two preserved in spirit, one from Tiflis, the other from Tehrán. They appear to be quite distinct from *C. aranea* (auct. *nec* L.), the tail being not only longer but differently coloured. In *C. aranea* it is yellowish; in *C. fumigata* the same colour as the back. They are also, I think, distinct from *C. Guldenstædtii*.

15. ***Sorex pusillus**, S. G. Gm.

S. G. Gm. Reise durch Rüssland, iii, p. 499, Pl. LVII, f. 1, (1774).—Fitz. Sitz. Akad. Wien, lvii, p. 505 (*cum syn.*)

This species was found by S. G. Gmelin, in the Steppes of Darband (Derbend), and also in Mazandarán, apparently at Mashad-i-Sar. It has not been recognized again, and the name is omitted in most recent zoological works. It is near *S. minutus*, L. (*S. pygmæus*[1], Pall.), but considerably larger. Gmelin gives the following measurements:—

	In. Lin.
Tip of nose to root of tail	3 . 7
Tail	1 . 1
Total	4 . 8

The inches are probably French, so the English measure would be rather more. The ears are said to be $4\frac{2}{4}$ lines long, the length being equal to the breadth, and several other dimensions are given, the value of which depends entirely upon whether they were taken on a fresh specimen or not.

The colour is said to be dark grey above, ashy below, the tail with white hairs on both sides, the whiskers ('Barthaare') passing from white into dark grey. The dentition is said to be[2] —M. $\frac{4}{4}$—$\frac{4}{4}$; C. $\frac{3}{2}$—$\frac{3}{2}$; I. $\frac{2}{4}=32$.

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[1] The name *S. minutus*, L. must stand for this species. Pallas states that he examined Laxman's specimen, upon which Linnæus's name was founded, and ascertained that it belonged to his *S. pygmæus*.

[2] These are not the correct names for the teeth, as Brandt has shown, but the number

I am quite unable to identify this with any known species, and can only hope that specimens may be procured from Darband or Mazandarán which may show whether it be a distinct species or not.

This species is also given by Schmarda, with doubt, as inhabiting Mesopotamia.

16. *? **S. Gmelini**, Pall.

Pallas, Zoogr. Ross. As. i, p. 134, Pl. X, f. 3.—Fitzing. Sitz. Wien Akad. lvii, p. 503.

This is another species which requires identification. Pallas refers, with a query, to Gmelin's description of *S. pusillus*, but his specimen must have belonged to a different form, at least the colour as described appears very distinct. I do not attach much importance to the asserted absence of ears in *S. Gmelini*.

The following is Pallas's description. I translate all except the characters:—

'*Sorex inauritus, rufescens, cauda concolore, tereti, setosa.*'

'Gmelin the younger sent me a specimen captured in Hyrcania, which I have figured, and which is undoubtedly distinct from all preceding species.

'Desc. In size and proportions it approaches *S. pygmæus*, but it is larger. Snout less elongate than is that of *S. araneus*. No prominent ears. Colour greyish subferruginous, yellowish below. Tail ferruginous yellowish, round, covered with little bristles (obsita setulis). Feet simple.'

This may be *S. minutus*, L., as has been suggested by Blasius. So far as I am aware no specimens are known to exist in any collection. Fitzinger considers it allied to *S. vulgaris* (*S. araneus*, L.), but he appears to be guided to a great extent by Pallas's figure. He also makes the mistake of giving the locality whence the type specimen was procured by Gmelin as the Crimea instead of Mazandarán.

Crocidura aranea (Schreb. *nec* L.) and *C. Guldenstædtii*, (Pall.) (? *C. leucodon*, Herm.) are said by Eichwald to be found in the Caucasus, and *S. fodiens*, Pall., (*S. carinatus*, Penn, apud Eichwald), in the Transcaucasian provinces. Pallas says that his *S. Guldenstædtii* is common in Georgia.

proves the species to be a true *Sorex*. Conf. Brandt, Bul. Soc. Mosc. xli, pp. 76-95. Brandt was clearly mistaken in referring this species to *Crocidura leucodon*, or *C. aranea*. Conf. Wagner in Säugethiere, v, p. 561.

FAMILY ERINACEIDÆ.

17. **Erinaceus macracanthus**, sp. nov. Pl. I.

Jujuk, Persian, at Karmán, *Khár-púsht*, (Thornback), at Shiráz.

1.	Dizak, Balúchistán	4000
2-4.	Máhún, near Karmán	6000
4-7.	Karmán	5000

E. *affinis* E. auriti, Pall., *aculeis longioribus, ad tergum posticum sesquipollicaribus, nigris, basin versus albido biannulatis; corpore subtus pilis longiusculis albidis, ad latera partim atque postice omnino fuscis, induto, pedibus fuscis.*

Hab. in Persiá.

The spines in large specimens are fully 1.5 inches long, where they attain their greatest dimensions on the hinder part of the back. They are surrounded by from 20 to 24 narrow longitudinal furrows, the ridges between which are more or less distinctly transversely sulcate, and bear tubercles at rather irregular intervals. Of the specimens obtained, three from Karmán are white throughout, being apparently either aged animals or albinoes; of the others the three which are adult or nearly so have the points of the spines black, the basal portion brown or brownish black, with two white rings, each about ¼ inch long. In a young specimen the points of the spines are whitish, then a black ring followed by a white one, and succeeded near the base by a short brown space. Probably the white tips wear off in time, and the spines become black at the end.

The spines commence on the forehead just between the anterior edges of the ears, in two belts, one on each side, a space free from spines running along the middle of the head to the nape[1]. The ears are thinly covered outside, and still more sparsely on their inner surface, with short white hair. The face, in adult specimens with dark spines, is covered with black and white hairs mixed, the moustachial hairs are black, and the longest from 1½ to 2 inches long. Sides of the neck and lower parts generally with rather soft hair of considerable length, white on the chin, neck, and breast, mixed with black towards the sides of the breast and on the abdomen, and brownish black around the thighs and lower abdomen; tail, legs, and feet covered with short blackish brown hair.

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[1] This character is often difficult to detect in stuffed specimens.

The following are the dimensions taken from fresh specimens of four apparently adult animals, in inches :—

	♂	♂	♀	♀
Length of head	1.7	1.97	1.9	2.1
Whole length from nose to insertion of tail, measured below	7.5	9.5	9.5	9.75
Tail	0.75	1.25	1.25	1.2
Length of ear measured inside, from orifice to tip	1.7	1.9	2	2
Length of ear measured outside, or from the crown of the head between the ears to the tip	1.45	1.7	1.7	1.8
Width of ear when laid flat	1	1.35	1.25	1.35
Fore foot to the end of nails	1.1	1.18	1.25	1.05
Hind foot, including tarsus, to end of nails ..	1.5	1.6	1.55	1.5

From the skeleton of an adult I take the following dimensions :—

	Inches.
Length of skull	2.2
Breadth to outside of zygomatic arches	1.17
Length of humerus	1.75
Length of radius	2.03
Length of femur	1.65
Length of tibia	1.8

It appears to me that the present species differs from *E. auritus*, Pall., even more than *E. hypomelas*, Brandt, *E. megalotis*[1], Blyth, and *E. pectoralis*, Heugl., do, since they are said only to differ in colour, and in the ornamentation of the spines, whilst in *E. macracanthus* the spines are much longer than in *E. auritus*. But as I can find no thorough description of *E. auritus*, and the only specimen in the British Museum is immature, and appears to differ in the character of its spines from the description of the typical *E. auritus*, I have sent a specimen of the Persian hedgehog and its skull to Dr. Peters of Berlin, who has most kindly compared it with the skins in the Berlin Museum, and finds that besides the differences I had pointed out, viz. that in *E. macracanthus* the spines are longer, and have the whole tip black, whereas in *E. auritus* the tips are whitish, there are several other distinctions between the two forms. In the Persian hedgehog the under parts are only partly white, the lateral and posterior portions being dusky, or black, whilst in *E. auritus* the lower parts are white throughout. *E. macracanthus* has also narrower ears, and a longer pointed snout. In the skull also,

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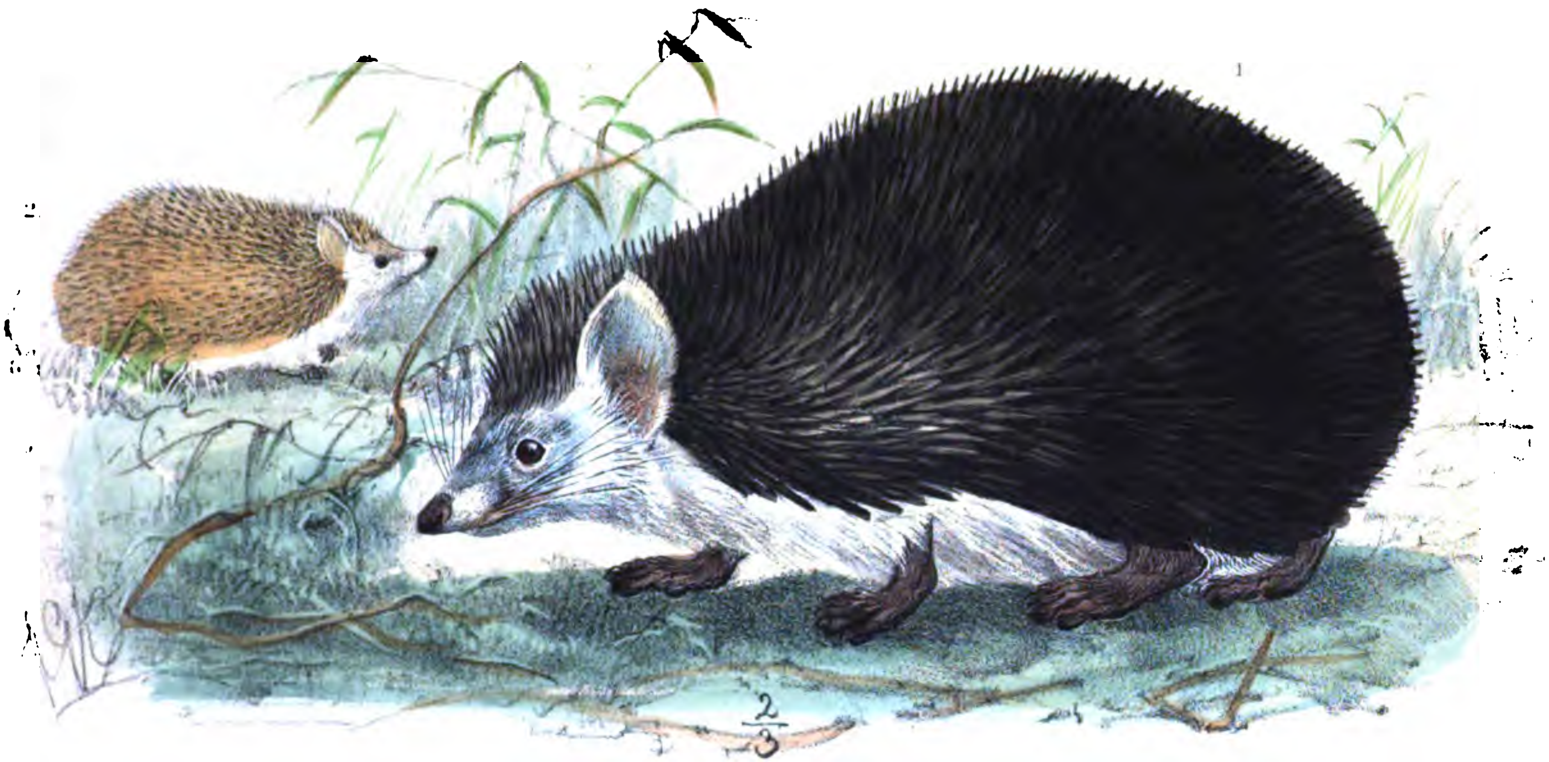
[1] This species is omitted in Fitzinger's 'Naturliche Familie der Igel,' in the Situngsberichte Kais. Akad. Wissenschaften, Wien, vol. lvi, p. 844. It was described in the Jour. As. Soc. Bengal for 1845, vol. xiv, p. 353, and vol. xv, p. 170, and is considered by Stloiczka, J. A. S. B. 1872, vol. xli, pt. 2, p. 225, distinct from *E. auritus*.

Pl. 1
Zoology of Persia.



J. G. Keulemans lith.

Mintern Bros. imp.

ERINACEUS MACRACANTHUS. 1, Adult. 2, Young.

Professor Peters informs me, there is much difference, the lachrymal foramen is less open, and the second lower premolar (the fifth in the row) decidedly longer.

I can give but little information as to the habits of this hedgehog. The specimens brought to me were said to have been obtained in gardens near towns, and I found remains of coleoptera and caterpillars in their stomachs.

E. auritus is included in Schmarda's list of the Mesopotamian mammals, but the assertion of its existence in Mesopotamia requires confirmation; it occurs both east and west of the Caspian, but has not been observed in Persia. Blyth's *E. megalotis* is from Kandahár, and may be found in North-eastern Persia. The long-eared type of hedgehog does not extend into India, though forms of it have been found in Arabia and North-eastern Africa. *E. Europæus* is said by Ménétries and Eichwald to inhabit the Caucasus, and the former observed it at Bákú.

[The hedgehog of Persia, though very common in some places, is by no means universally distributed. From six to seven thousand feet above the sea seems to be its favourite elevation. I first saw it at Abádeh, half way between Shiráz and Isfahán, and afterwards at Eklíd, a cluster of villages embosomed in gardens and walnut groves a day's march south of Abádeh. Here it is very plentiful, as it is at Máhún near Karmán.—O. St. J.]

CARNIVORA.

Family FELIDÆ.

18. *Felis leo, L.

Leo Persicus, Swains.
Shir, Persian.

The lion at the present day is found in Mesopotamia, on the west flanks of the Zagros mountains east of the Tigris valley, and in the wooded ranges south and south-east of Shiráz. It nowhere exists on the table land of Persia, nor is it found in Balúchistán. The Persian lion is said to be a short maned variety, like that of North-eastern Africa.

According to Fitzinger, Sitz. K. Acad. Wiss. Wien, lviii, 1868, p. 440, *Leo Persicus* is found in Persia, Afghánistán, and Turkestán, whilst

L. Guzeratensis, said to be a much larger animal, with a different mané, extends through Southern Persia to Mesopotamia and Arabia. Now parts of Southern Persia and Mesopotamia are the only tracts in Persia in which lions are found, and none are known to exist in either Afghánistán or Turkestán. In the same way the tiger is said by the same writer to extend through Tibet and Kábul to Southern Persia. It is certainly found in neither of the two last countries, and in Tibet probably only to the eastward. I call attention to these mistakes to show the extreme caution with which the statements of localities current in many European works must be received. It is only of late years that the study of exact geographical distribution has become prevalent; many localities given by older writers are erroneous, and museum labels, when not authenticated by trustworthy collectors, should be quoted with caution.

[Lions, which are very numerous in the reedy swamps bordering the Tigris and Euphrates, are found also in the plains of Susiana, the modern Khúzistán, and extend into the mountain country south of Shiráz as far east as longitude 53°. I have no accurate information of its northern limits, but Captain Pierson, who spent many years in the country between Tehrán and Bághdád, tells me that he never heard of lions in the oak forest west of Karmánsháh. It is the acorns of this same oak (*Quercus ægilopifolia*, according to Aucher-Eloy), which feed the wild pigs whose presence tempts the lion into the mountains of Fárs. The south-western slopes of the great mountain barrier which shuts off the plateau of Irán from the coast are clad, as far as the meridian of Shiráz, from the altitude of four to eight thousand feet, with considerable forests of this tree. In appearance it is not unlike our English oak, but never reaches the same size. The foliage is deciduous, and the leaf dark green like that of the ilex, which it resembles in shape. The acorns are very large, and in times of scarcity are ground by the inhabitants and mixed with flour to make a bread which is proverbially unpalatable. Further east and north the oak is replaced by scanty jungle of the wild pistachio, and here the lion does not venture. In the lower valleys the king of beasts is occasionally seen about the beds of rivers, where reeds and thick groves of wild myrtle afford him convenient shelter.

The little valley of Dashtiarjan, thirty-five miles west of Shiráz, is notorious for the number of lions found in its vicinity. Part of the valley is occupied by a fresh-water lake, on the edges of which are extensive beds of reeds; the surrounding hills, which rise some four thousand feet above the valley, itself six thousand five hundred feet above the sea, are covered with oak forest, or with pretty thick brushwood of hawthorn, wild pear, and other bushes, and contain very extensive vineyards. Dashtiarjan is thus a perfect paradise for swine, and they increase and multiply accordingly, so that the lions have plenty to eat, varying the monotony of constant pork with an occasional ibex, or with a calf from the herds which graze in the valley. Every year some four or five adult lions are killed in Dashtiarjan or the neighbourhood, and a few cubs brought in to Shiráz for sale.

In the early part of my sojourn in Persia, having much time on my hands, and being fresh from tiger shooting in the north-west of India, I made many attempts to add a lion's skin to my trophies, but without success. Many a weary tramp have I had over the hills following the tracks of lions which had killed cattle in the plain; and more than one night have I spent rolled up in a blanket behind a heap of stones, with a white calf tied in front of me, in the hope of a shot. All was in vain. I never caught a glimpse of a lion in Persia till I had been in the country more than three years, when the fact of their existence was impressed upon me in a manner more unexpected than pleasant.

In the month of March, 1867, my camp was at the caravanserai of Mian Kotal, half way up the Kotal Pírizan pass, which crosses the highest range between Shiráz and Bushire, about fifty miles from the former city. Having business in Shiráz, I sent out a horse half way, rode in, and was returning a couple of days later, when I met the Kossid carrying the monthly packet of letters from Bushire. Looking through these lost me an hour, and it was not till sunset that I entered the oak forest south of Dashtiarjan with five miles of steep mountain road before me. Contrary to my usual habit, I carried no gun, being unarmed, with the exception of a Colt's revolver of the smallest size. I was mounted, I may say, on a bay Arab fifteen hands high. I had crossed a tiny rivulet, said to be a favourite drinking place of lions, and where indeed I had often seen their foot-prints, and had just begun the ascent of the hill by a path covered with loose boulders, when a tawny shape moved noiselessly out of the trees some thirty yards in front. Whether my horse stopped or I pulled him up, I do not know, but there we stood; the lioness, for it was evidently a lady, gazing at us, motionless but for a gentle waving of the tail, and the horse and I looking straight at her. I mentally execrated my folly at not having brought a gun, for a fairer shot it was impossible to imagine. After the lapse of a few seconds, thinking it time to end the interview, I cracked my hunting-whip, and gave a loud shout, to intimate to her ladyship that she had better clear out, never dreaming for a moment that lion or tiger would have the courage to attack a man on horseback. To my astonishment, instead of sneaking back into the forest as I expected, she deliberately charged us down hill, and sprang at the horse's throat. Whether from miscalculation of the distance through the unevenness of the ground, or from my jerking the horse's head up with the curb, I cannot say, but she missed her spring and came down under my right stirrup. With a goodsized pistol I could have broken her spine as she stood bewildered for a moment, but to fire a bullet hardly bigger than a pea, with only a few grains of powder behind it, into the loose skin of a lioness, would have been folly; so I stuck in the spurs, with the intention of making tracks as fast as the nature of the ground would allow. But the poor horse was paralysed with fear; not an inch would he budge, till the lioness, recovering from her surprise, made a swift half circle and attacked us from behind; not leaping on the horse's back with all four legs, as is so often represented in pictures of Persian sporting, but rearing on her hind legs, and embracing the horse's stern with her forepaws, while trying to lay hold of his flesh with her teeth. As may be supposed, I lost no time in jumping off, with no more damage than a tear in my strong cord breeches, and a slight scratch in the thigh. Directly the horse felt himself relieved of my weight, he reared and plunged violently, sending me head over heels among the stones in one direction, and the lioness in the other. Expecting the brute to be on me at once, I pulled out my miserable little pistol, and picking myself up as soon as possible, looked about me. There stood the lioness, not five yards off, sublimely indifferent to me and my proceedings, waving her tail, and gazing intently at the horse, which had trotted twenty yards down the road. She made a few swift steps after him, when I fired a couple of shots over her head, hoping to drive her off. The only effect was to start the horse off again, when the lioness again charged him from behind, and clinging to his quarters both disappeared among the trees.

So far I had had no time to feel much fear, but, as soon as the source of danger was no longer visible, my nerves began to get somewhat shaky. Perhaps I ought to be ashamed to say that I did not lose much time in ensconcing myself in the branches of a convenient oak tree, some twenty feet from the ground. A few minutes at that secure altitude sufficed to restore my nerve somewhat, and I reflected that there were the regulation three courses open to me, to stay where I was, to go forward, or to go back. The first involved spending a March night on the top of a tree, the bottom of which was 7000 feet above the sea, and I hate cold. The second presented the not over agreeable prospect of a five mile walk over a villainous road through the forest, with the chance of meeting more lions without a horse to take off their attention; moreover my holsters and saddle-bags contained valuables, and even if the steed was killed I might recover these by prompt action. I therefore made up my mind to follow the horse and his enemy, and as the shades of night were fast gathering round me, lost no time about it. Half a mile down the road I found my unfortunate steed bleeding fast from a wound in his quarter, and still in such a state of terror that he declined to let me approach him.

There was nothing to be done but to drive him out of the forest into the plain, which was not many hundred yards off, and to walk on to the nearest village for assistance. This was the little walled hamlet of Kaleh Mushír, a mile or so off, which I reached without mishap save an alarm from a herd of pigs which charged past me towards the lake as if a lion was after them.

A single family tenanted Kaleh Mushír during the winter. From them I got a little acorn bread and dates. No bribe would induce the man to come out with me that night with torches to find the horse; but I found him the next morning at daybreak, after a night made sleepless by the most vigorous fleas I have ever met. The poor brute was grazing quietly in the plain, and allowed himself to be caught without difficulty. Although his quarters and flanks were scored in every direction with claw marks, only one wound had penetrated the flesh, and this to a depth of two inches, making as clean an incision as if cut with a razor. This I sewed up, and in a week the horse was as well as ever, though he bore the scars of his adventure for the rest of his life. It is perhaps worthy of remark that the distance apart of the scratches made by the two outer claws of each stroke with the paws was between fourteen and fifteen inches.

The 'lútís' or mountebanks of Persia are often accompanied by a captive lion, trained to eat a joint of mutton off the chest of a boy, who throws himself down on his back. It is not a pleasant exhibition, the child being generally much alarmed. I once asked a Shiráz lútí which took the most thrashing to learn his part, the lion or the boy; but a grin was the only answer he vouchsafed.—O. St. J.]

19. *Felis tigris, L.—De F.

Babr, Persian[1].

The tiger is only found in Persia in the Caspian provinces, Mazandarán, and Ghílán, lying to the north of the Elburz mountains, and corresponding in part to the ancient Hyrcania[2]. These provinces, unlike the plateau of Persia, are covered with dense forest, and in them the tiger ranges up to an elevation of at least 5000 or 6000 feet. To the westward it extends as far as the Caucasus and Mount Ararat, being found not far from Tiflis.

[Tigers are very numerous in the Caspian provinces of Persia, and in the Caucasus as far as the mouth of the Araxes. The dense vegetation, European in its forms, but tropical in luxuriance, which covers the low land near the coast, and the hills to a height of six thousand feet, affords a shelter as perfect as the jungle of the Tarai, or the swamps of the Sunderbunds. Whether the tiger extends through the hills east of the Caspian into Central Asia, where he is known to exist, is a matter of uncertainty. Ferrier in his 'Caravan journeys' speaks of tigers in the jungles of the Hari Rúd north-west of Herat, but he does not mention having seen skins.

Cubs are often captured in Mazandarán and brought to Tehrán. I have seen specimens in the Bágh-i-Wáshi quite equal in size to Bengal tigers.—O. St. J.]

20. *Felis pardus, L.—De F.

Palang, Persian.

The leopard occurs, to the best of my belief, thoughout Persia and Balúchistán. In the latter country I saw its tracks on several occasions.

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[1] S. G. Gmelin, Reise, iii, p. 485, gives 'Palang' as the Persian name. This really means a leopard, but may sometimes be used loosely for a tiger. In India, curiously enough, *Sher* means a tiger, and *Babr-sher*, a lion.

[2] Allusions to the tigers of Hyrcania are common amongst the Roman writers, e.g. Virg. Æn. iv. 367, Ecl. v. 29; Virgil also mentions 'Caucasiæ tigres,' Georg. ii, 151.

[Leopards are found everywhere in the mountains of Persia. In the markets of Isfahân skins are always obtainable.—O. St. J.]

21. *F. uncia, Schreber.

I have seen ounce skins in London said to have been brought from Persia.

[An ounce's skin was brought to me at Shiráz, said to have been obtained in the neighbouring hills.—O. St. J.]

22. *F. catus, L.

Major St. John informs me that he has shot the common wild cat of Europe near Shiráz. Eichwald states that it occurs around the shores of the Caspian.

[I feel nearly sure that the European wild cat is found in Persia. In 1864, I shot an immense male in the pass near Kamáraj, between Shiráz and Bushire, which, from the size of the skull and shortness of the tail, as well as the markings of the skin, I supposed to be *Felis catus*. It was unfortunately lost off the mule to which I tied it, so that I did not preserve the skin. Some years afterwards the darvish, who inhabits a little imámzádeh or shrine at the Tang-i-Allah-hu-akbár at Shiráz, told me that a wild cat, which lived in the mountain above him, was in the habit of paying its addresses to the female cats kept by my religious friend. One evening I saw the amorous visitor, and he appeared to me to look like *F. catus*, though of course he may have been a domestic cat gone wild. The darvish begged me not to shoot him, lest I should bring bad luck on the imámzádeh.—O. St. J.]

23. *F. jubata[1], Schreb.—De F.

Guepardu guttata (Herm.), Gray, Cat. Carn. Mam. p. 39.
Yúz-palang, Persian.

The hunting leopard is certainly found in Persia, but I am unable to give any particulars as to its distribution. According to Eichwald it does not extend into the countries west of the Caspian, though found to the eastward. De Filippi says that it is found in Mazandarán.

[I have only seen the hunting leopard in captivity at Tehrân. It was said to have been brought from the Caspian forests. It is not used at present for sporting purposes in Persia.—O. St. J.]

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[1] The name *Felis jubata* of Scherber was published in 1778, Säugth. iii, Pl. CV; *F. guttata* of Hermann in 1804, Observ. Zool. i, p. 38.

24. F. chaus, Güldenstädt.—De F.

Chaus catolynx, Gray, Cat. Carn., etc. Mam. Brit. Mus. p. 36.
Gúrba-i-Kúhi (Hill-cat), Persian.

1. Khisht, north-east of Bushire 1800

The specimen obtained by Major St. John is of a yellowish brown colour, the hair on the back being black near the end with whitish tips; ears red with black tips; tail with a black tip and one or two imperfect rings, and there are the usual black marks inside the forearm and thigh, but they are not extensive; lower parts pale rufous; chin white, hair about the soles of the feet black, and the central portion of the tarsus below is blackish.

A precisely similar specimen was obtained in Mesopotamia by Loftus. The length of each, when fresh, must have been at least three feet, of which the tail forms about a fourth.

Felis chaus is common in Western Persia and on the Caspian, and I believe that it is found throughout the country.

[*Felis chaus* is very common in Southern Persia. I have shot it at Shápúr (3000 feet), in a ravine of the hills near Borasjún (500), and on the Kárágatch, more than 6000 feet above the sea, showing that this cat is not particular about climate. In the last mentioned place I found three kittens, so young as to be unable to drink milk. I reared them with some difficulty, till about three months old, by which time they became very tame and playful, climbing up on to my knees when at breakfast, and behaving very much like ordinary domestic kittens. Unfortunately one was killed by a greyhound and another by a scorpion, within a few days, on which the survivor became morose and refused to be comforted, even by the society of a kitten of his own age, which I procured as a companion to him. When I left Persia, in 1867, he was a year old, and very large and powerful. Two English bull terriers I had, who made short work of the largest domestic cat, could do nothing with my wild cat. In their almost daily battles the dogs always got the worst of it. I may add that I have examined the living specimens of *Felis chaus*, and *F. Cashmirianus* in the gardens of the Zoological Society, and have no doubt that the cat found in South Persia belongs to the former species. I am not aware how far it may extend northwards; I myself have not seen it north of Shiráz.—O. St. J.]

25. *F. caracal, Schreber.

Siyah-gúsh (Black-ears), Persian.

This small lynx is certainly found in Mesopotamia and the neighbouring districts of Persia, and a specimen from Dizfúl, brought home by Loftus, is in the British Museum, but I cannot say whether it is met with on the Persian highlands.

F. lynx is found in the Caucasus, according to Pallas, Eichwald, and Ménétries (who calls the species *F. cervaria*, Temm), and it may possibly extend into Ghílán and Mazandarán.

FAMILY CANIDÆ.

26. Canis aureus, L.—De F.

1. Bampúr, Balúchistán 1800

The jackal is common in parts of Persia, but comparatively rare on the plateau, except in the neighbourhood of large cities, where it inhabits the enclosed gardens, orchards, etc. It is met with throughout the Caspian provinces and extends to the Caucasus, and I frequently saw it in Balúchistán.

27. * Canis lupus, L.—De F.

Gúrg, Persian.

De Filippi says that he met with wolves near Kazvín and that they are common in the Elburz mountains, and Ménétries mentions their occurrence in the Khanate of Tálish. I did not observe any in Persia, but I learn from Major St. John that they are common on the more elevated plateaux, such as that crossed on the road between Shiráz and Isfahán, about Asupás, Dehbíd, etc., and that near Soh, north of Isfahán. On these plains wolves remain throughout the year, not leaving in winter. They are less common at lower elevations, but Major St. John has seen one at Kázrún, north-east of Bushire, only 2800 feet above the sea. Near the shores of the Persian Gulf they do not occur. Persian wolves are of large size.

In this, as in several other cases, I identify the Persian animal with the European because I have no means of comparison, and I know of no difference. But it is quite possible that the Persian wolf may differ from the European, as does *Canis laniger*, Hodgson (*C. chanco*, Gray), the '*Chángú*' of Tibet.

28. C. sp.

Sag-gúrg (Dog-wolf), Persian.

1. Abádeh, north of Shiráz 6000

The only specimen of this animal, which was obtained with much trouble by Major St. John, is a skin, in bad condition and without the skull. I am quite unable to identify it. It is smaller than any wolf, but very large for a jackal, the feet being considerably more powerful than in the large Abyssinian jackal, *Canis variegatus*. The fur is very similar to that of the common wolf, the hairs on the back being coarse and rather long, the tips whitish mixed with black, underfur rather woolly with a pale lilac tinge. The lower parts have been whitish. There are no black marks, so far as can be ascertained, on the feet or head, the hair on the muzzle and ears seems to have been rather pale ferruginous. All hair is gone from the tail, so it is impossible to say what colour it may have been. The length of the skin from the nose to the insertion of the tail is about three feet.

I have very little doubt but that this is some undescribed form. The Persians say it is a hybrid between a wolf and a shepherd's dog. The cry is very different from that of the wolf.

29. * ? Vulpes vulgaris, Gray.

According to Ménétries the common fox is found near Lankorán, at least he marks it as occurring there in his table of Geographical distribution, though he does not mention the locality, at p. 19, where he says that this fox is common in the Caucasus. It is possible some other race may have been confounded with *V. vulgaris*, but it was not apparently *V. melanotus* (=*Karagan*), which is separately mentioned by Ménétries. Pallas also gives the Caucasus as a locality, Zoogr. Ros. As. i, p. 47.

30. * ? Vulpes Karagan, (Erx.)

Canis melanotus, Pall., Mén. Cat. Rais. p. 19.
V. melanotus, (Pall.), De F. Viag. in Persia, p. 343.

There is a specimen thus labelled in the Turin Museum brought back by De Filippi from Persia. The exact locality is not noted. In his book De Filippi merely remarks of it, 'Common even in the steppes. Its fur is an important article of commerce.' It is possible that De Filippi's specimen, although labelled 'Persia,' may have been procured from Georgia; in which case there is, so far as I know, no evidence of the occurrence of the species within Persian limits. Both Eichwald and Ménétries notice its existence in the Caucasian provinces.

31. * **Vulpes Persicus,** sp. nov. Pl. II[1].

Rú-báh, Persian.

1. Mountains near Shiráz	about 6000.
2. Isfahán	about 5000.

V. pallidus, rufescenti-isabellinus, fronte ferrugineá, auribus extus pallide rufis, apices versus nigris, marginibus isabellinis, pilis dorsalibus pallidis, canescentibus, plerumque nigro terminatis, postice magis rufis, vellere purpurascenti-cinereo, lanoso, longo ; lateribus ventreque pallide isabellinis, vellere cinerascente vel albido ; caudá rufescente vel isabelliná, subtus pallidiore, apice albo vel nigro nullo ; pedibus extus rufis, nonnullis pilis nigris sparsis immixtis. Long. corporis cum capite (*ad corium siccatum*) *circum* 24, *caudæ* 14, *auris* 3.5, *pedis posterioris cum tarso* 5, *capitis* (*ossis*) 5.15.

Hab. in Persiá, circum Shiráz, Isfahán, etc.

This form appears most nearly allied to *V. leucopus*, Blyth (J. A. S. B. 1854, p. 729, and Jerdon, Mammals of India, p. 151), with which it agrees in size and general colouration, except that there is no admixture of black in the lower parts, and the underfur is dark greyish purple instead of pale cinereous. In neither of the specimens obtained is there a trace of a white tip to the tail. Another allied form is *V. Griffithii*, Blyth, from Afghanistan, but that is considerably larger and rather different in colour.

In neither specimen of *V. Persicus* is the fur on the back in good order, only a few of the long hairs remain, and it is consequently difficult to say what the general colour of this part may be in the full winter dress; but it is clear that the species is very pale, and perhaps of nearly the same colour as *V. leucopus*.

The forehead is bright rufous, the nose paler, and there is a blackish mark running from the front of each eye to the upper lip. The long moustachial hairs are black, the hindmost being about three inches long. The ears outside are pale rufous at the base, black towards the tips, the extreme margins and the hairs near the margins on the inside being pale isabelline. On the back of the neck and shoulders the long hairs are whitish (hoary), many of them with black tips, on the back there is a mixture of black and rufous tips, but all the hairs show whitish rings. The underfur throughout the upper part of the body is purplish grey, long and woolly. The flanks and under parts are pale isabelline, the underfur varying from lilac grey to white. The tail is rufous above in one specimen, whitish in the other, the hairs with black ends in each case, it is very pale below in both, and has neither white nor black tip. The legs are rufous outside with some black hairs mixed on the front of the fore legs, the feet being the same colour as the legs, not white, as they are said by Jerdon to be in *V. leucopus*.

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[1] In the plate the ears are too short.

Length of head and body about two feet (this measurement is a mere approximation, being taken on stuffed skins), tail about 14 in., ear from orifice 3½ in. (probably 4 in. at least in fresh specimens). Tarsus and hind foot 5 in. The skull of an adult, but not old specimen, measures 5.15 in. in extreme length, 2.85 across the zygomatic arches, 1.3 from the point of the postorbital process of the frontal bone on one side to that on the other. Mandible 3.8 long, measured from the angle to the anterior alveolar margin. This skull is smaller than that of *V. vulgaris*, and has much smaller anterior palatal foramina.

Vulpes flavescens, Gray, A. and M. N. H. 1843, vol. xi, p. 118, and Cat. Carn. etc. Mam. B. M. p. 203, was described as from Persia, and may perhaps be found in some part of the country. The type in the British Museum was purchased from Mr. Warwick as long ago as 1842; and as the species has not been found by any trustworthy observer within our area, whilst Dr. Gray in his latest publication assigns as the habitat the Panjáb Salt Range[1], I think it unwise to include the species in the Persian fauna without further information.

At the same time I should add that a good sized fox, which I saw on two or three occasions in Balúchistán, so far as my memory serves, was much like *V. flavescens*, but I think on the whole it is more probable that it was *V. leucopus*, Blyth.

32. * ? Vulpes corsac, (L.)—De F.

This is said by De Filippi to be found everywhere. I could, however, find no specimen in the Turin Museum, and the few foxes I saw in Persia were certainly not *V. corsac*. I think it possible

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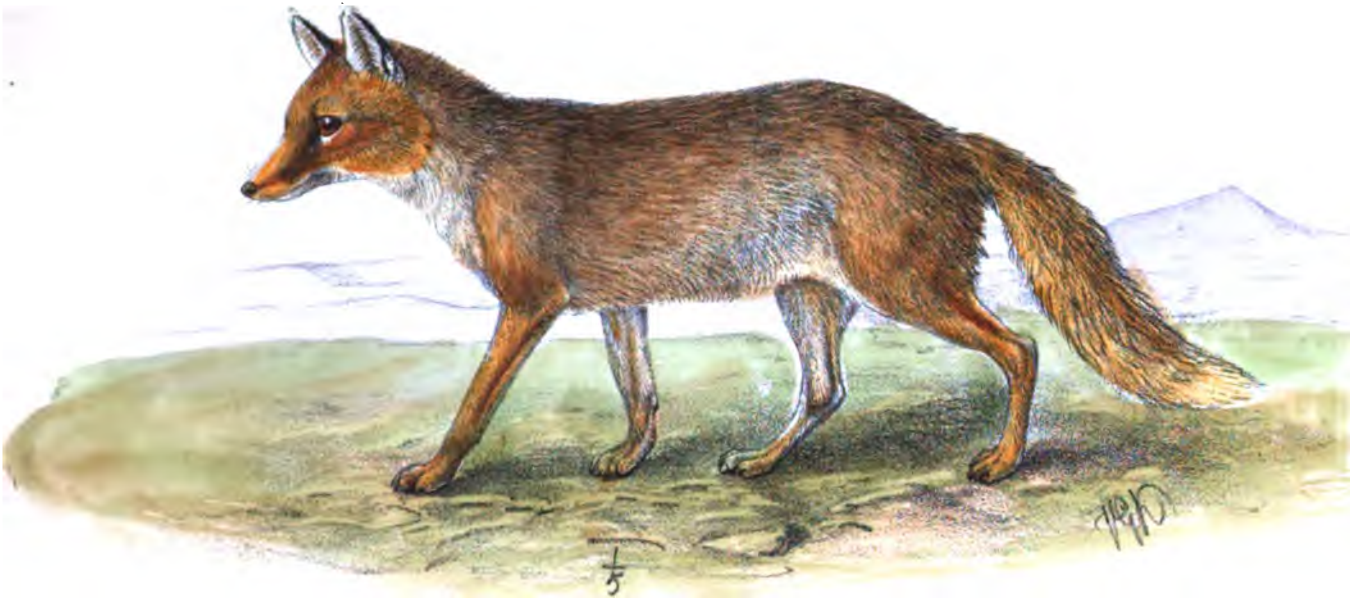
[1] In this case it should be the same as Blyth's *V. pusillus*, formerly referred by that naturalist to *V. flavescens*, but subsequently considered distinct.

Pl. II
Zoology of Persia



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VULPES PERSICUS.

that De Filippi was mistaken in his identification. Schmarda includes it in his list of Mesopotamian species; but here also further information is, I think, desirable. In fact we know very little of the Persian foxes.

33. * **Vulpes famelicus ?** (Rüpp.)

Canis famelicus, Rüpp. Atlas, Pl. V.

A live specimen of a young fox-like animal from Bushire has lately (June, 1874) been presented to the Zoological Society of London. I was at first disposed to believe it undescribed, but after again examining it with Dr. Sclater, and comparing it with the figure and description of Rüppell's *Canis famelicus*, I think it may perhaps be referred to that species. It agrees fairly in colour, though it wants the dorsal chesnut stripe described by Rüppell, and it has a distinct black mark in front of the eye, which is not shown in Rüppell's figure or mentioned in his description. Rüppell's animal was from Dongola. Dr. Sclater tells me that he believes the Bushire fox probably the same as one formerly living in the Zoological Gardens, brought from the neighbourhood of Mount Sinai. It is by no means improbable that the Asiatic form is different from that inhabiting North Africa, but they are clearly closely allied, and require further comparison.

Major St. John informs me that he is well acquainted with this small, pale-coloured, long-eared fox, and that it is only found, so far as he is aware, in the low ground near the Persian Gulf. He has never seen it on the Persian plateau. I am indebted to Dr. Sclater for the following note about this animal, written by Mr. Oswald, the gentleman who brought it to England:—'It was captured a short distance from the town of Bushire, where these foxes are very numerous. The ground is rocky close to the sea shore, and the animals retreat into rocky cavities. They are, of course, predatory, and commit depredations in the hen-roosts of neighbouring villages. The foxes are easily captured with the aid of dogs, and Europeans resident in Bushire frequently amuse themselves hunting these animals, which often take to the sea, seeking safety from the dogs.'

It appears to me highly probable that this may be Schmarda's *Vulpes corsac* of Mesopotamia. It is a very different animal from the true *corsac* of Pallas.

FAMILY HYÆNIDÆ.

34. * **Hyæna striata**, Zimm.—De F.

Common in Balúchistán and on the Persian plateau, and it extends throughout the whole country to the Caucasus. Major St. John tells me he has seen them near Shiráz and Kázrún, and that during the intensely cold winter of 1865–66, when all the country was covered with snow for three months, a sergeant of engineers shot a hyæna at the door of the post house at Dehbíd, 7500 feet above the sea. Hyænas are also found, according to Schmarda, in Mesopotamia.

FAMILY VIVERRIDÆ.

35. * **Herpestes Persicus**, Gray.

P. Z. S. 1864, p. 554.—Cat. Carn. Mam. p. 151.
Viverra mungo, Gm. partim, Syst. Nat. i, p. 84.—Pall. Zoogr. Ros. As. i, p. 75.
Músh-í-Khourma (Date-rat), Persian.

The species thus named is the small ichneumon of Mesopotamia, one of the types having been obtained by Loftus in the date groves of Mohamráh, near the mouth of the Euphrates. The other locality quoted by Dr. Gray, Rhugistan, is perhaps a mistake for Khúzistán, a district of Persia bordering the lower course of the Tigris and Euphrates, and in which Mohamráh (Mohammerah) lies.

H. Persicus is in general appearance a miniature of the common large *H. griseus* of India: it is gray, with a fulvous tint, the hairs grizzled, parts of each hair being whitish. The length of stuffed specimens is a little under 2 feet, the tail measuring 10½ inches, skull 2.45.

I did not myself notice any ichneumon in Persia, but Major St. John informs me that he has met with one near Shiráz, which is probably the same as *H. Persicus*. S. G. Gmelin, in his Reise durch Russland, iv, p. 211, gave an elaborate description of one brought from Baghdad. This description was copied by Gmelin, Schreber, and other naturalists, who confounded the species with *Viverra ichneumon*, var. *β* of Linnæus, *V. mungo*, Gm., which is, I believe, the oldest name for *H. griseus*, Geoff.

I have an indistinct recollection of having seen a mungoose, probably *H. griseus*, in Balúchistán, but I have no note of its occurrence.

It is highly probable that some species of civet or genet inhabits the wooded hills of South-western Persia, but I can find no record of such having been observed by any one. The form most likely to be met with is *Genetta vulgaris*, or some allied species.

[I have obtained an ichneumon in the neighbourhood of Shiráz, and in the plain of Persepolis, but have not seen it elsewhere. It seems to me smaller than the Indian ichneumon.—O. St. J.]

Family MUSTELIDÆ.

36. * Lutra vulgaris, (Erxl.)

Sag-i-áb (Water-dog), Persian.

The common otter inhabits Ghílán and Mazandarán, and a species, probably the same, is found on the Persian plateau, in the few rivers which are perennial. I have seen a skin from near Isfahán. This animal is also found in Mesopotamia, according to Schmarda.

[De Bode states that otters are so common in Khúzistán that their skins form an important article of commerce. I have seen tracks of otters on the Bandámír, near Shiráz, and on the streams in the Elburz.—O. St. J.]

37. * Mustela Sarmatica (?), Pall.—De F.

Major St. John informs me that he once saw a species of weasel in Southern Persia, but that he was unable to capture it, or determine the species. It may perhaps have been *M. Sarmatica*, Pall., which is recorded by De Filippi from Erivan, is found both in Transcaucasia and Afghánistán, and has a wide range throughout Central Asia. In the Caucasus *Mustela vulgaris*, L., *M. foina*, L., and *Martes abietum*, Ray (*Mustela martes*, L.), are said by Eichwald to be found, but chiefly on the northern and western slopes, so it is doubtful whether they extend into Persia. The first two are also quoted from the same locality by Ménétries, whilst *M. erminea*, L., although not known in the Caucasus, has a wide range throughout Central and Northern Asia, and may possibly be found in parts of Persia. Both *M. erminea* and *M. vulgaris* are said to occur in Persia by Gmelin, Syst. Nat. i, pp. 98, 99.

[Once only have I seen a weasel in Persia. This was near Sháhpúr. The animal was very light tawny, almost yellow in colour, and I should think half as big again as a polecat.

I am told that martens' (*Martes abietum* ?) skins are commonly sold at Isfahán, said to come from the westward. But whether this means Asia Minor, or the forests of the Zagros, I cannot say.—O. St. J.]

38. Meles canescens, sp. nov. Pl. III.

Gúr-Kan (Grave-digger), Persian.

1.	Abádeh, between Shiráz and Isfahán	7000
2.	Isfahán	5000

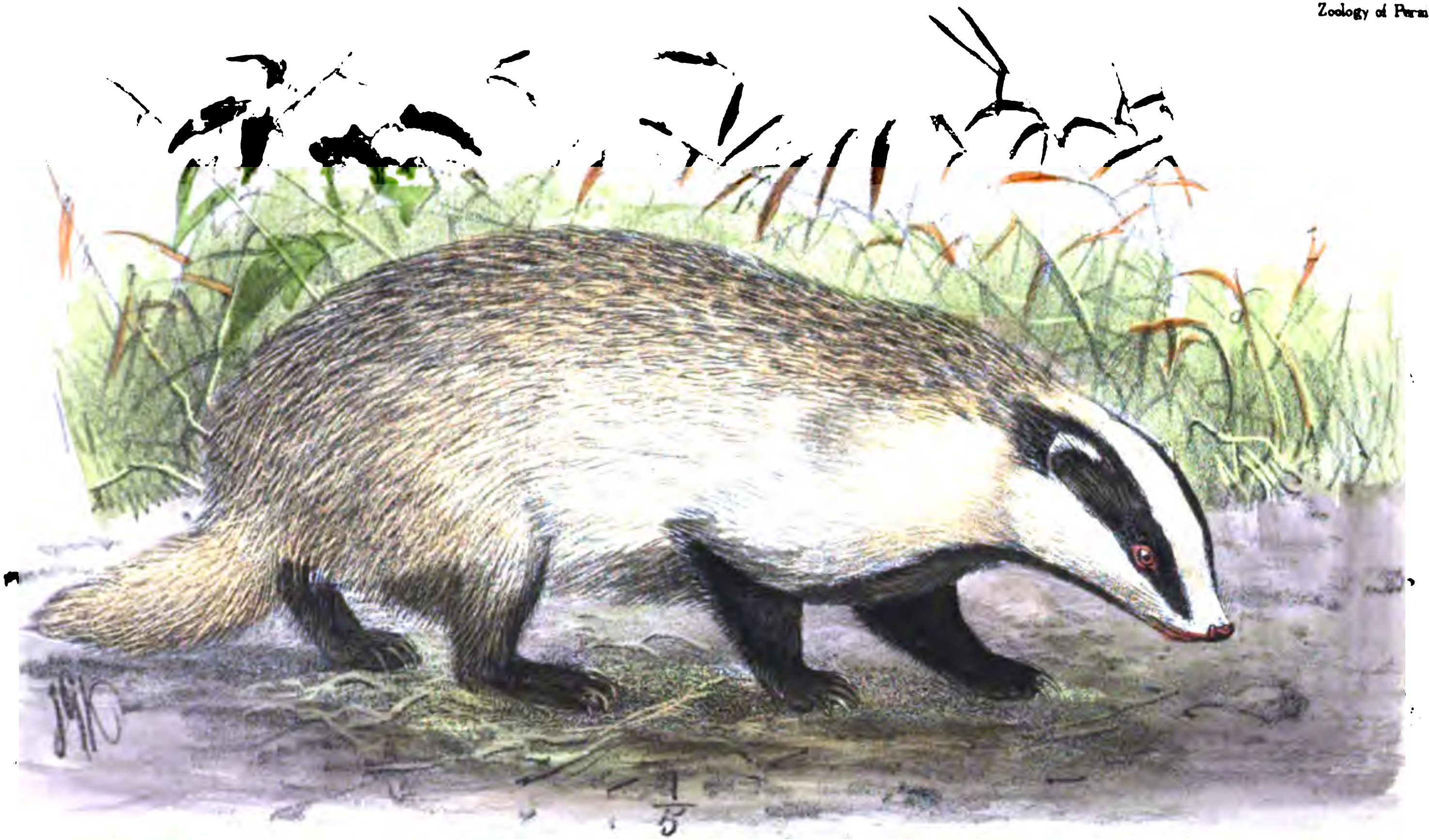
M. *affinis* M. taxo, *sed minor, dorso canescenti-griseo, haud fusco, dentibus posticis angustioribus.*

One of the two specimens procured, both of which were obtained by Major St. John, is a very good stuffed skin, in excellent order, and containing a perfect skull, which I have extracted; the other is a skin in bad condition, and without the skull; still, coming as it does from a different locality, it is useful as showing that the peculiar colouration is constant.

The general colour of the upper parts is pale grey or hoary, the hairs being almost white, except near their tips, where all on the back, and some on the sides, are black, the tips themselves being white. The middle of the face, from between the ears to the nose, the cheeks and flanks, are almost white; the usual broad bands along each side of the face, including the eyes and ears, and terminating a little behind the ears, blackish brown, as are also the chin, throat, breast, middle of belly, and limbs, the breast and abdomen being rather paler brown than the other parts. The anterior edge of the ears is white.

This species is at once distinguished from *Meles taxus* by its very much paler colour and smaller size; but as so many of the Persian animals are paler in colour than their European allies, I should not have proposed a new name for the Persian badger, had not the skull, when compared with a series of skulls of *M. taxus*, presented the following differences. The nasal portion is shorter in *M. canescens*, the skull between the orbits is proportionally somewhat broader, the bony palate is more concave between the hinder molars and

Pl. III.
Zoology of Persia



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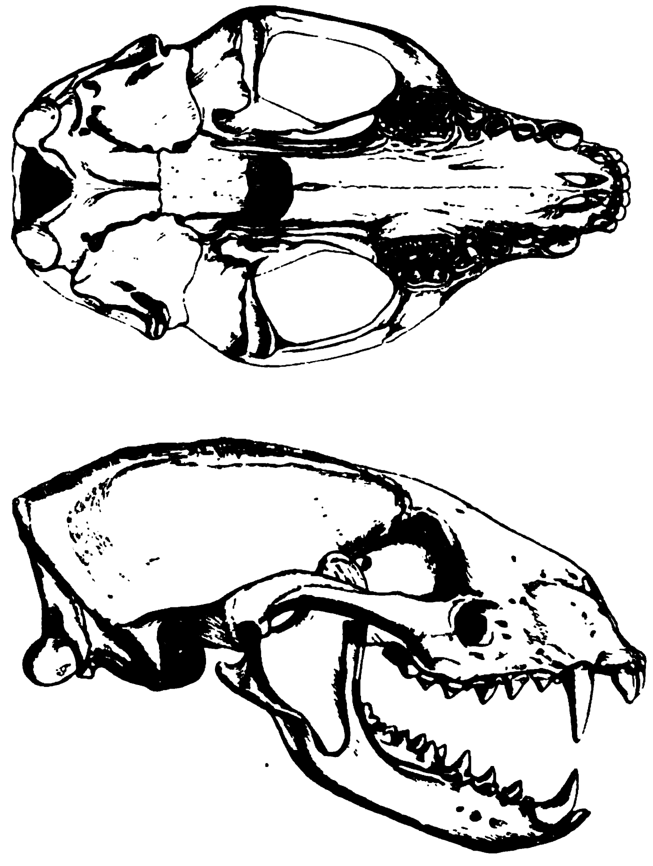
MELES CANESCENS.

behind them, whilst a low ridge runs forward for some distance along each side of the palate, from the anterior termination of the pterygoid process. This appears wanting in the European badger. In the Persian skull, too, the zygomatic arches are vertically narrower, whilst



Skull of *Meles canescens*, two-thirds natural size.

the two posterior molars in both jaws, but especially in the upper, are narrower in proportion to their length. In four adult skulls of *M. taxus* I found the proportion of the breadth of the upper molar to its length to vary between 0.48 in. to 0.58 (1 : 1.2) and 0.49 in. to 0.55 in. (1 : 1.12), whilst in the skull of *M. canescens* the same tooth measures 0.43 in. broad, and 0.58 long (1 : 1.35). The dimensions of the skull of *M. canescens* (that of a fully adult but not aged female) are: extreme length (from the centre of the occipital crest to the alveolar margin of the præmaxilla), 5.1 in.; breadth across hinder portion of zygomatic arches, 2.9 in.; breadth of brain-case, where narrowest, behind the postorbital processes of the frontal bone, 1 in.; length of lower jaw, from the angle to the anterior alveolar margin, 3.1 in.

The length of the stuffed skin, from the nose to the insertion of the tail, is 2 ft. 9 in.; the tail is slightly imperfect. The sole of the fore foot measures 2¼ in. (claws not included); the hind foot, from the tarsal (ankle) joint to the end of the toes, measures 3.9 in.

The European badger is said to be common in the Caucasus and may perhaps inhabit Northern Persia; indeed it is said by Pallas and Gmelin to be found there, but I do not include it, as they may very possibly have mistaken *M. canescens* for it. Schmarda gives a species of *Ratelus* (*Mellivora*) from Mesopotamia. It is possible that this may be *Meles canescens*, the colouration of the back being somewhat like that of *Mellivora Indica*.

[The Persian badger is pretty common on the plateau. It seems to be generally found in walled gardens, and has the reputation, as its Persian name denotes, of digging up and devouring corpses[1]. I have not seen the badger further south than Dehbíd, a hundred miles north of Shiráz.—O. St. J.]

Family URSIDÆ.

39. * ? Ursus arctos, L.—De F.

Eichwald and Ménétries call the bear of the Caucasus and Transcaucasian provinces *U. arctos*, and De Filippi applies the same name to the bear of the Elburz. Major St. John, however, who has seen several Elburz bears, assures me that, although they are darker than the true *Ursus Syriacus* which is found in Southern Persia, they are much paler in colour than the common bear of Europe.

Until specimens can be compared it must be left a doubtful question whether the bear of Northern Persia be a dark variety of *U. Syriacus*, or a pale form of *U. arctos*. Some naturalists consider these two merely as varieties, others state that there are well marked structural distinctions. *U. Syriacus* appears to me a slighter, more lightly built animal than *U. arctos*, but I have only seen specimens in captivity. Middendorf, St. Peters. Verh. Min. Ges. 1850–51, p. 74, distinguished his *U. arctos* var. *meridionalis* on skulls from the Caucasus.

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[1] The same accusation is made against *Mellivora Indica* in Northern India, and the animal is usually known in English as the Grave-digger. W. T. B.

40. * Ursus Syriacus, Hemp. and Ehr.

Khirs, Persian.

This is, as Major St. John assures me, the bear of South-western Persia. It is not the bear of Balúchistán, but is said to be found between Bampúr and Bam. It is found pretty commonly in the neighbourhood of Shiráz and in the hills bordering on Mesopotamia.

[This bear is found throughout the mountains of Western and Northern Persia, possibly extending to Khorassán. In many places watchers are set at night to keep the bears from the ripening grapes. At Imámzádeh Ismail, some fifty miles north of Shiráz, I once saw an old male bear which had been shot the night before in a vineyard, and whose stomach contained an almost incredible quantity of unripe grapes. He was so old as to be quite toothless, and the middle of his back was quite bald from the neck to the rump, though not at all mangy, and though the hair was thick enough elsewhere.—O. St. J.]

41. * U. sp. (? ? *Melursus labiatus*).

Mamh, Balúch.

I have been assured by many natives that a black bear is found in Balúchistán, and one man recognised a bearskin holster cover as being made of fur similar to that of the animal found in the country. My enquiries never produced any of the skin, though once a bottle of grease, said to have been obtained from a bear, was brought to me. I was rather surprised to hear of any bear in so utterly desert a region; for these animals are, as a rule, more or less frugivorous, and but little fruit can be found in Balúchistán.

The Indian bear, *Ursus labiatus*, Desm., is the only black bear known to exist in the countries bordering on Balúchistán, and this animal has not, so far as I know, been met with west of the Indus, whilst it is one of the most thoroughly insectivorous and frugivorous of all bears, its food being principally the combs of termites (white ants) and various wild fruits. If it be this bear which inhabits Balúchistán, it probably lives on roots.

FAMILY PHOCIDÆ.

42. * Phoca vitulina, L.

P. canina, Pall. Zoogr. Ros. As. i, p. 114.
P. Caspica, Nils. Wiegm. Arch. 1841, p. 313.
Callocephalus Caspicus, Gray, Cat. Seals, B. M. 1866, p. 22.
Sag-mahi (Dog-fish), Persian.

As is well known, the common seal of Northern Europe is found in large numbers throughout the Caspian. The animal there met with is separated from *P. vitulina* by a few naturalists, but the greater number, including, I believe, all who have had the best means of judging, consider it identical.

CETACEA.

Whales and porpoises abound on the Makrán coast, and porpoises are equally common in the Persian Gulf, but whales are much more rare. Still some occur, for I found the vertebra of one on the island of Kishm. Formerly whales were possibly more numerous than they now are, for in the 'Voyage of Nearchus[1],' it is stated that the fish-eating inhabitants of the Makrán coast, in the days of Alexander the Great, used bones of whales to build their houses. Thanks to the researches of Mr. Blyth, we know pretty well what the great whale of the Makrán coast is, but as regards the porpoises (*Delphinidæ*) I can only suggest that several of the Indian species probably occur. (Conf. Blyth's Catalogue of the Mammals in the Museum of the Asiatic Society, Jerdon's Mammals of India, Owen, Tr. Z. S. vi, p. 17, etc.).

43. Balænoptera Indica, Blyth.

J. A. S. B. xxviii, 1859, p. 488; xxix, p. 451.
Physalus Indicus, Gray, Cat. Seals and Whales, B. M. 1866, p. 162.

This, one of the largest, if not the largest, of existing whales, is, according to Blyth, the only species commonly found throughout the seas of India, Persia, and Arabia. It attains commonly to a length of from 80 to 90 feet.

I have repeatedly heard from the officers of the Makrán coast telegraph of their having seen whales off the coast. In a recent instance a dead whale was found entangled in the submarine telegraph cable, and for years a large whale haunted the harbour of Maskat in Arabia.

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[1] Quoted by Blyth, J. A. S. B. 1859, xxviii, p. 481.

RODENTIA.

FAMILY SCIURIDÆ.

44. Sciurus fulvus, sp. nov. Pl. IV, fig. 1.

1.	Oak forest, near Shiráz	4000

S. *affinis* S. Syriaco *sed valde pallidior, dorso griseo-rufescente, antice magis rufo, gastræo isabellino, fronte rufâ, genis isabellinis, caudâ mediâ superne ferrugineâ, ad latera subtusque fulvâ, multo breviore quam corpore, auriculis haud penicillatis.*

Hab. in quercetis haud procul ab urbe Shiráz.

Similar to *S. Syriacus* in size and proportions, but very much paler in colour everywhere. The back is fulvous grey or rufescent grey, becoming more rufous on the shoulders and flanks; these colours pass gradually into the isabelline tinge of the lower parts. Forehead brighter rufous, sides of the head, including the supercilia, the same colour as the lower parts. Tail bright ferruginous along the central line above, dull rufescent at the sides and below.

The fur is neither harsh nor very soft; the hairs on the posterior portion of the back are chiefly whitish, mixed with some rufous and a few black hairs, the underfur is dark slaty. There are a few black piles intermixed on the shoulders, back of neck, and upper part of the head, and on the sides of the tail a few dark brown hairs are mixed with the prevailing isabelline tint. The ears are not tufted, but covered with short hair of the same pale rufous colour as the nape. Whiskers black.

As I have only a stuffed specimen, I can give but approximate proportions. From nose to rump measures 9 in., tail to the end of the hairs 7½ in. Forefoot (from the carpal joint to the end of the claws) 1¼ in., hind foot similarly measured and including the tarsus 2.1 in.; longest whisker about 1¾ in.; hair on the back about half an inch long.

Besides its much paler colour, this form differs from *S. Syriacus* in having the sides of the head paler than the forehead, and in the more gradual passage from the colour of the back into that of the lower parts.

S. fulvus is only known to inhabit the oak forest near Shiráz.

[A pale coloured squirrel is found in the oak forest west of Shiráz, but nowhere else in Persia that I know of, though there must be one in the Caspian provinces. The southern squirrel is by no means common. I only saw it twice, and had one live specimen brought to me.—O. St. J.]

45. * ? S. Persicus, Erxl.

Erxl. Syst. Nat. Mam. p. 417.—S. G. Gmelin, Reise d. Russl. iii, p. 379, Pl. XLIII.

This was described from Ghílán by the younger Gmelin, who asserts that it is common. Pallas, however, (Zoogr. Ross. As. i, p. 187, (doubts the existence of any such species, and points out not only that no specimen of this squirrel existed amongst the specimens sent by S. G. Gmelin, but also that he had found the latter writer untrustworthy in other particulars.

The following is a translation of Gmelin's description: 'The squirrels in this country (Ghílán) appear dark ashy grey above, the region around the eyes is black, the ears rounded, expanded, naked inside, and covered externally with blackish hair. The nostrils are round, the chin, breast, and belly yellow, the lateral portions of the same white. The tail is blackish grey, and marked below along the centre with a white stripe. The hairs which cover the feet to the base of the claws are above of the same colour as the upper part of the body, and below like the lower parts. The hands and soles of the feet are dark red. Otherwise this Asiatic squirrel has the same stature and habits as the European.'

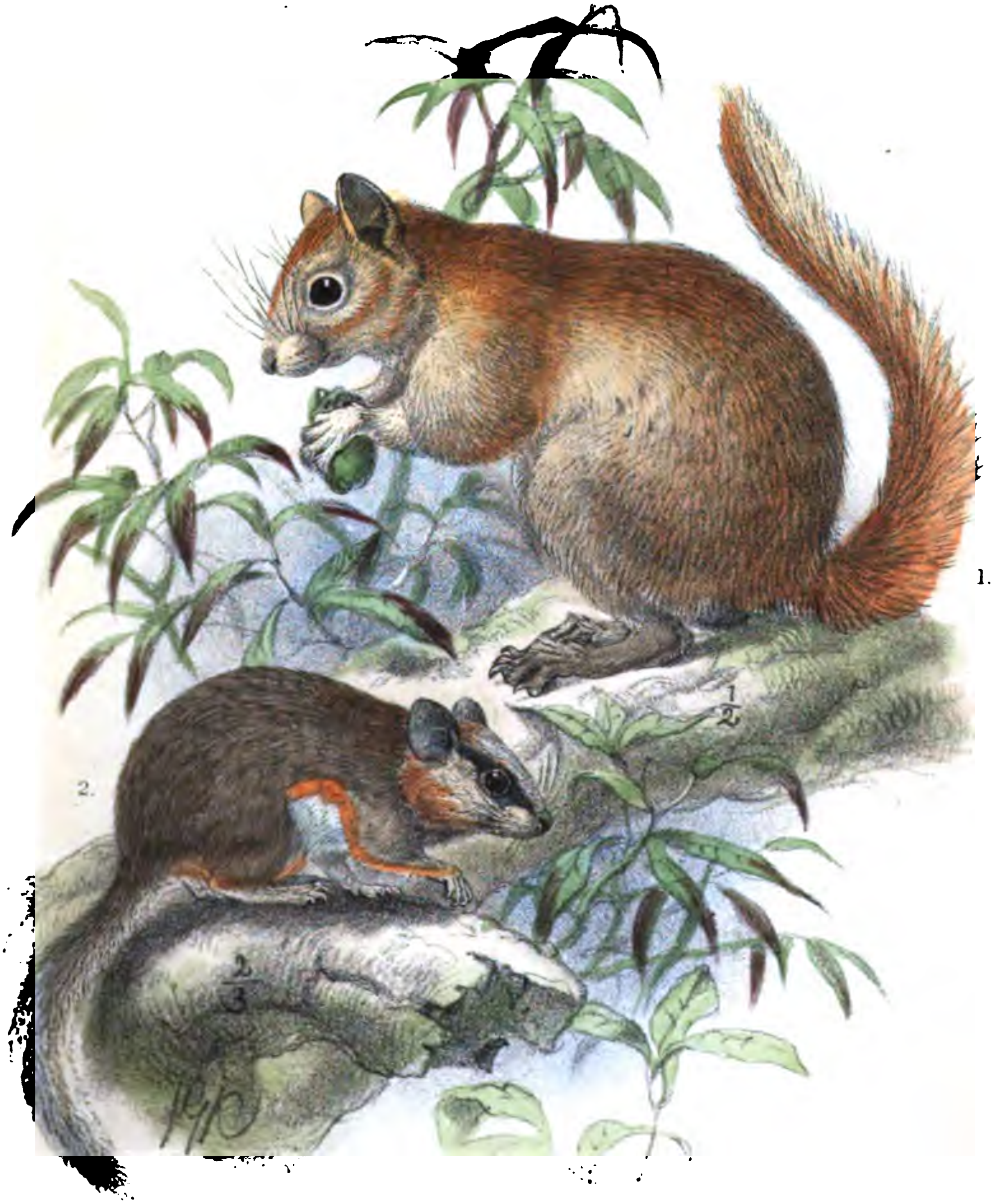
S. vulgaris, L. is said by Eichwald to abound throughout the Caucasus. It is called *S. vulgaris cinereus* by Fitzinger, Sitzb. Akad. Wien, LV, Ab. i, p. 475. *S. anomalus*, Güldenstädt, Schreb. Säugth. p. 781, pl. 215 c (=*S. Caucasicus*, Pall.), is described from the Caucasus and Georgia, but I cannot say if it be found in Persia. It may possibly be the same as *S. Persicus*.

46. S. palmarum, L.

1. Píshín, Balúchistán	500

Only one example was seen. The species chiefly inhabits the drier parts of India, keeping much to cultivated tracts and trees near villages; it does not extend to the east of the Bay of Bengal, nor is it found in the larger forests.

Pl. IV.
Zoology of Persia.



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1. SCIURUS FULVUS
2. MYOXUS PICTUS

[*Sciurus palmarum*, which we saw in Balúchistán, does not extend into the low country about Bushire.—O. St. J.]

47. * Spermophilus concolor, Geoff.—De F.

Spermophilus concolor, Geof., Belanger, Voy. Ind. Or. p. 151, Pl. VIII.
S. (*Colobotis*) *concolor*, Brandt, Bull. Acad. Sc. St. Pet. ii, 1844, p. 379.
Arctomys fulvus, Licht., De F. Viag. in Persia, pp. 195, 344.
Músh-i-Sultániah, Persian.

This marmot was first collected by Belanger on his road to India and described by Geoffroy St. Hilaire. De Filippi unites it to *Arctomys fulvus*, Licht. (*Spermophilus*, sp. auct. *Colobotis*, sp. Brandt), and certainly the two species, of which I saw specimens side by side in the Turin Museum, are very closely allied to each other, the Persian skin being rather greyer; but without better means of comparison I am unable to determine whether these forms are merely varieties or whether they are distinct. By most naturalists they are kept separate.

S. concolor occurs in parts of North-western Persia, and especially at Sultániah, north-west of Kazvín. An animal bearing the same Persian name, and probably identical, was noticed by Dr. Bellew át the Kafir-Kaleh hills, thirty miles south of Meshed, but I have not been able to examine specimens.

S. musicus, Mén. inhabits the higher portions of the Caucasus and should be looked for in the Elburz.

Family CASTORIDÆ.

48. * ? Castor fiber, L.

The beaver, according to Eichwald, is common in the Araxes, and Schmarda includes it in his Mesopotamian list. I insert it in the Persian fauna with some doubts.

49. Myoxus pictus, sp. nov. Pl. IV, fig. 2.

1, 2.	Kohrúd, north of Isfahán	7000

M. *dorso pallide rufescenti-murino, gastræo albido, margine rufá colorem dorsalem a ventrali utrinque secernente, et ad femora, humeros, lateraque colli infra aures in maculas ferrugineas dilatatá; facie antice a fronte pallidá, grisescente, utrinque fasciâ nigrá a nari ad* *extremitatem anteriorem auris ductâ, regionem ocularem amplectente, marginatâ, mystacibus superioribus nigris, inferioribus albis; auribus rotundatis, parum pilosis, fere nudis; caudâ corporem longitudine subæquante, ubique hirtâ, pilis longis indutâ, supra griseâ, subtus albescente; pedibus parvis, supra albis, subtus pallidis.*

Affinis M. dryadi, *a quo differt colore, caudâ præsertim pallidiore, maculisque ad latera colli rufis, auribus majoribus, pedibus brevioribus.*

Hab. ad Kohrúd in Mediâ, (Persiâ hodiernâ septentrionali).

As I had only descriptions of *Myoxus dryas*[1], Schreber, to refer to, and these did not give sufficient details for certainty, I could not feel sure whether the dormouse, of which I obtained two specimens in Persia, was identical with Schreber's species or not. The colouration especially appeared rather brighter. For the determination of this question I am indebted to the kindness of Professor Peters of Berlin, who has taken the trouble to compare one of my specimens with authentic skins of *M. dryas*. He says that the Persian species appears to differ from *M. dryas* in colour, in the tail being whiter, in its having red hair beneath the ear, in the ear itself being somewhat larger and more hairy, and especially in the feet being smaller, the sole of the hind foot measuring 24 mm. (nearly an inch) in *M. dryas*, and only 19 to 20 in the new form. The teeth, Professor Peters adds, are nearly the same, the first lower molar appearing to be longer, and not rounded in the Persian animal; but as the comparison was only made with one skull of *M. dryas*, this difference may be individual.

The fur on the back and upper portion of the head is rather light brown with a rufous tinge, the under parts pure white, sharply separated from the dark colour of the back; along the flanks, at the line of junction, is a more rufous band passing into the brown above, and expanding into bright rufous patches on the thighs, shoulders, and sides of the neck below the ear. Nose pale; a black band runs along each side of the face from the side of the nose to the ear, and includes the eye; whiskers black above, white below. Ears rounded, nearly naked, with scattered short pale hairs inside and out. Feet white above, pale coloured and naked below. Tail very bushy throughout, not more so at the end, grey above, with a few black hairs mixed, greyish white below.

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[1] Schreb. Säugth. iv, p. 831, Pl. CCXXV, B: *M. nitidulæ*, Pall. Zoogr. Ros. As. i, p. 179, *excl. syn.*

The following dimensions were taken on freshly killed animals :—

	♂	♀
Length from nose to base of tail	3.8	3.5
Tail from base to end of hairs	(imperfect)	3.5
Length of fore foot	0.5	0.4
Length of hind foot	0.8	0.78
Height of ear from orifice	0.63	0.6
Breadth of ear laid flat	0.6	0.6
Longest whisker	1.7	1.6

The two specimens were brought to me at Kohrúd, where they were said to have been obtained on trees.

Two or three unnamed species of *Myoxus* are included in Schmarda's list of Mesopotamian animals. *M. glis* is said by Pallas to be common in Georgia.

FAMILY MURIDÆ.

50. **Mus rattus**, L.

1–3. Resht, Ghílán, near the Caspian Sea.

According to Eichwald, the black rat is found in the Caucasus and in Georgia. Major St. John obtained specimens at Resht, but it is unknown on the Persian plateau.

51. **M. decumanus**, Pall.

1–4. Gwádar, Balúchistán.

The original home of the brown rat, which is said to have made its way into Europe through Eastern Russia about 1725–1730, and to have come from the Caspian, appears as great a mystery as the man with the iron mask. Most writers assert positively that it came from Persia, some give Persia and the East Indies as its original home. The East Indies comprise rather an indefinite region, extending, I believe, from the Cape of Good Hope to Kamschatka, but Blyth and Jerdon have shown that in Hindustan *Mus decumanus* is chiefly confined to the larger towns (and this is my own experience also), and Major St. John informs me that, during many years' residence in Persia, he never saw a rat, except in the ports on the Persian Gulf. I obtained specimens at Gwádar, where they had doubtless been, as usual, introduced by ships, but I saw none elsewhere, although I collected rodents wherever I could, and always offered rewards for small mammals, numbers of which were brought to me. De Filippi, too (Viag. in Pers. pp. 196, 344,) notices the absence of the brown rat in Persia; and Hutton (J. A. S. B. xv, p. 140,) says it is not found in Kándahár. Unless, therefore, the migration to Europe about 1730 was so complete that every individual left Persia, and none ever returned to it, which is absurd, the source of this pest remains to be found. Blyth suggests that it probably came from the temperate regions of Eastern Asia, J. A. S. B. 1863, xxxii, p. 338.

According to Eichwald, *M. decumanus*, as well as *M. rattus*, is found in the Caucasus and in Georgia. He also asserts that it is found in Persia; but this assertion is, of course, made upon report, whilst he perhaps ascertained personally the existence of the animal in the Caucasian provinces.

The bandicoot, *Mus bandicota*, is said to be found in the ports on the Persian Gulf, and Major St. John tells me that he has seen a very large coarse haired rat at Bushire. But as large individuals of *Mus decumanus* are commonly called bandicoots in India, I think a specimen should be compared before the animal is included in the Persian list. If it is found, it is doubtless an immigrant, brought by ships, and confined to the sea ports.

[There is no house rat in the plateau of Persia, though the black rat is found in the towns on the Caspian, and the Hanoverian rat, as well as the bandicoot, on the shores of the Gulf, whither they have doubtless been brought by ships. The wide desert tracts that intervene between the ports and the interior, and the absence of waggons carrying grain or other bulky goods up country, the means of transport being restricted to beasts of burden, have probably prevented its spreading. Thus it happens that Persia, which is often put down in zoological works as the original home of the common house rat, is one of the few countries that is yet free from that pest.—O. St. J.]

52. M. erythronotus, sp. nov. Pl. V, fig. 3.

1–4. Kohrúd, north of Isfahán 7000

Mus supra ferrugineus, nigrescente lavatus, lateribus magis rufis, infra albus, coloribus bene discretis, haud transeuntibus; caudá fere nudá, corporis longitudinem subæquante, auribus magnis, rotundatis, fere nudis; pedibus superne albis, plantis nudis, fuscis: mammis 6, *duobus pectoralibus, quatuor inguinalibus. Long. corporis cum capite circum* 4, *auris* 0.55-0.7, *latit. ejusdem* 0.45-0.5, *long. plantæ* 0.9, *palmæ* 0.4, *poll.*

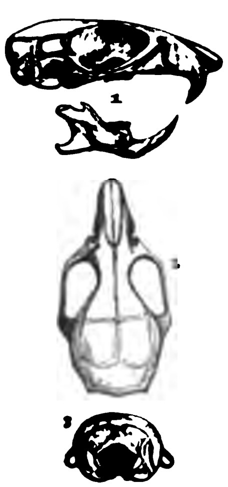
Hab. ad Kohrúd in Mediá.

Colour above rufous washed with blackish, below white, the two colours not passing into each other, but sharply divided. The hairs on the upper part of the body are blackish, slaty at the base, bright ferruginous towards the points, the extreme tips being black ; on the sides the black tips are wanting. Upper whiskers black, lower and anterior white. Ears rather large, rounded, almost naked inside and out ; tail the same length as the head and body, or rather longer, nearly naked, with very scattered short bristly hairs, black and white mixed above, white below. Feet white above, beneath quite naked and dusky, the latter colour being characteristic.

There are but six mammæ, one pair being pectoral, and situated just behind the axils, and two pairs inguinal.

The following dimensions in inches were taken from fresh specimens :—

	♂	♀
Length of head and body	4	3.8
Length of tail	4.2	3.8
Height of ear from orifice to tip	0.7	0.55
Breadth of ear laid flat	0.5	0.45
Length of fore foot	0.4	0.4
Length of hind foot	0.9	0.83
Longest whisker	1.45	1.35



Skull of *Mus erythronotus*, nat. size.

The following are the measurements of two skulls, male and female, in decimals of an inch :—

	♂	♀
Extreme length from upper margin of foramen magnum to end of nasal bones	1.1	1.04
Breadth across hinder part of zygomatic arches	0.55	0.5
Breadth across frontal bones where narrowest behind postorbital processes	0.18	0.17
Length of nasal bones	0.43	0.4
Length of molar teeth in upper jaw	0.14	0.13
Breadth of palate between molar teeth	0.12	0.11
Length of lower jaw from condyle to anterior alveolar margin	0.55	0.53

The zygomatic arch is very narrow and weak, much more so than in *M. Bactrianus*.

I only obtained specimens of this mouse at Kohrúd, where it is said to be found in fields.

53. M. Bactrianus, Blyth, Pl. V, fig. 2.

M. Bactrianus, Blyth, J. A. S. B. xv, 1846, p. 140, and xxii, p. 347.
M. gerbillinus, Blyth, J. A. S. B. xxii, p. 410, Cat. Mam. Mus. As. Soc. p. 119.
M. Theobaldi, Blyth, J. A. S. B. xxii, p. 583.
M. sylvaticus, De F. Viag. in Persia, p. 344, nec L.
Músh, Persian.

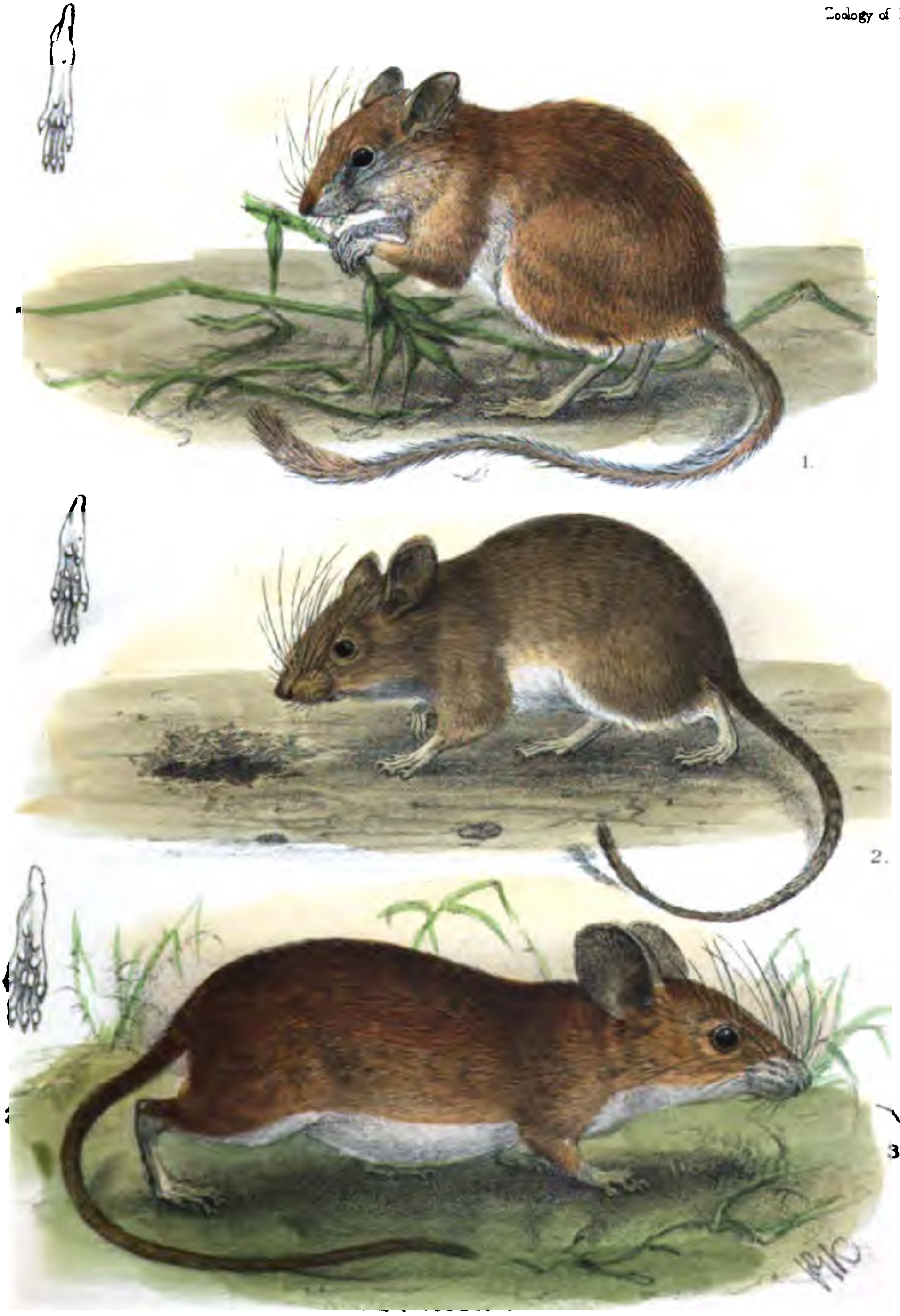
1.	Píshín, Balúchistán	500
2–5.	Near Píshín	—
6–13.	Kalagán, Balúchistán	3500
14–18.	Bampúr, Balúchistán	1700
19–24.	Mashísh, south-west of Karmán	5000
25.	Shiráz	4700

This species was first described by Mr. Blyth, from specimens brought by Captain Hutton from Kándahár, where it is said to be the common house mouse, as it is in Balúchistán and Southern Persia. The name first given by Mr. Blyth, *Mus Bactrianus*, is objectionable, as this animal has never been obtained from Bactria proper, the modern Balkh.

Although my specimens are rather larger than Mr. Blyth's types, and their colour is rather darker, they agree well with typical examples from Kándahár, presented by Captain Hutton to the British Museum, and the skulls are precisely similar. Mr. Blyth subsequently described two other mice, one from Pind Dádun Khán in the Panjáb, as *M. gerbillinus*, said to be sandy-brown, the other, of the same colour, from Káshmír, which he named *M. Theobaldi*: both of these he ultimately united to *M. Bactrianus*. The descriptions given of these mice show that both size and colour are slightly variable, and I have some small specimens, palpably adult, which differ very little in size from the dimensions given by Mr. Blyth. It appears probable that the present species is the house mouse of the extreme north-west of India, Káshmír, Afghánistán, Balúchistán, and Southern Persia.

The Persian house mouse is about equal in size to *M. musculus*, with largish ears, and the tail about the same length as the body, varying from a little shorter to a little longer. The colour is brown above, usually with a sandy tinge, sometimes rufescent, especially on the sides; lower parts white, not abruptly separated from the colour of the back; soles of feet whitish. The tail is thinly clad throughout with short light brown hair, soft not bristly. The ears are naked inside,

Pl. V.
Zoology of Persia.



J. G. Keulemans del.

Mintern Bros imp.

1. GERBILLUS NANUS.
2. MUS BACTRIANUS.
3. MUS ERYTHRONOTUS.

except near the margin, where they are rather thinly covered, as they are on the outside, with short hair. The basal portion of the hair on the back is dark ashy, a few black hairs being mixed with the brown ones on the back. There are two pairs of inguinal, and three pairs of pectoral mammæ; of the latter, two are in a line just behind the axils, the third in front of and inside the shoulders.

The following measurements were taken on fresh specimens: 1, captured at Píshín; 2, at Kalagán; 3, at Dizak, all in Balúchistán; 4, at Mashísh, south-west of Karmán:—

	1 ♀	2 ♂	3 ♀	♂
Length from nose to root of tail	3.5	3.6	3.25	3.5
Length of tail	3.1	3.6	3.45	3.3
Length of head	1	1.05	0.9	
Height of ear from orifice	0.56	0.53	0.53.	0.55
Breadth of ear laid flat		0.44	0.46	0.45
Length of fore foot and claws	0.3	0.32	0.33	0.4
Length of hind foot and claws	0.65	0.75	0.72	0.75

There is some variation in the size and shape of the ears, some specimens having them shorter and rounder than others.

The following are the dimensions of two skulls, both of males: 1, from Kalagán; 2, from Bampúr:—

	In.	In.
Length from upper margin of foramen magnum to end of nasal bones	0.92	0.8
Breadth across hinder part of zygomatic arches	0.49	0.42
Breadth across frontal bones where narrowest behind post-orbital processes	0.14	0.14
Length of nasal bones	0.3	0.27
Length of lower mandible from the condyle to the anterior alveolar margin	0.5	0.41

The zygomatic arch is strong and well developed. These skulls agree well with one in the British Museum, taken from a Kándahár specimen.

De Filippi identified the Persian house mouse with *M. sylvaticus*, and he states that the same species was brought from Shiráz by the Marquis Doria. But a specimen from Shiráz, which I obtained, is certainly the present species, which, although similar in colour, is a larger mouse than *M. sylvaticus*, with a much longer tail. Unfortunately, I have no specimens from Northern Persia, and the house mouse there may be *M. sylvaticus*, but it is quite as probable that it is the present form.

54. *Mus sylvaticus, L.—De F.

I have already mentioned that, according to De Filippi, this is the house mouse of Northern Persia, but I think it would be well to compare specimens with the last species. Even, however, if *M. Bactrianus* prove to be found in houses throughout Persia, *M. sylvaticus* must also be included in the fauna, as it was found by Ménétries common on the parts of the Tálish mountains not covered by trees, and it is said by Eichwald to be abundant in Georgia.

Eichwald includes *Mus musculus*, L., and Ménétries, *M. minutus*, Pall. (*M. messorius*, Shaw), in the fauna of the Transcaucasian provinces. The latter probably may extend into Persia, but De Filippi particularly noticed the absence of *M. musculus* in the north-western part of the country, where he says it is replaced by *M. sylvaticus*.

55. Cricetus phæus, Pall.—De F.

1, 2.	Mashísh, south-west of Karmán	6800
3–7.	Shiráz	4700
8–18.	Kohrúd, north of Isfahán	7000

This hamster appears to be common throughout the Persian highlands, chiefly, I think, about gardens and cultivation. It is found in towns and villages, coming into houses.

The following are the dimensions, in inches, of five fresh specimens taken at Kohrúd:—

	♂	♀	♀	♀	♂
Length of head and body	4	3.75	4.1	4.2	4.9
Length of tail from anus	1.25	0.9	1.2	1.2	0.9
Length of head	1.2	1.15	1.15		1.22
Length of fore foot	0.4	0.45	0.48	0.42	0.42
Length of hind foot	0.7	0.62	0.68	0.68	0.62
Height of ear from orifice	0.76	0.75	0.7	0.77	0.75
Breadth of ear laid flat	0.6	0.52	0.57	0.6	0.56
Longest whisker	1.4	1.3	1.25	1.4	1.5

The male, of which the dimensions are given in the last column, instead of being of the usual cinereous colour, had a decidedly rufous tinge, and this, added to the larger size, made me suspect that it might belong to De Filippi's *C. isabellinus*. That, however, is still larger, and paler in colour.

56. *C. isabellinus, De F.

De Filippi, Viag. in Persia, p. 344.

The following is a translation of the original description in Italian: 'Closely resembling the preceding (*C. phæus*) in the general distribution of the colours, in the quality of the fur, and the proportions of the body and of the tail, but of much larger size, and sensibly different colouration. From the point of the nose to the root of the tail 0.15 metre[1] (in *C. phæus* 0.095[2] at the most;) length of the tail 0.028[3]. Greyish isabelline above, rather paler on the sides, lower half of the body pure white, the two colours sharply distinct, especially at the sides of the body. Captured at Tehrán by the Marquis Doria.'

I could not find a specimen of this species at Turin or Genoa.

57. *C. nigricans, Brandt.—De F.

This Caucasian species was found by De Filippi at Sultániah, northwest of Kazvín.

Fitzinger (Sitzingsb. K. Akad. Wiss. Wien, 1867, vol. lv, Abth. i, p. 504) gives Mesopotamia and Persia amongst the localities for *Spalax typhlus*, but I cannot find any trustworthy authority for the locality. In Schmarda's Mesopotamian list an unnamed species of *Siphneus* is included; this may perhaps also be *Spalax typhlus.* Eichwald, however, declares that this species has not been observed south of the Caucasus.

S. Pallasii, Nordman, is also said to be found in the Caucasus by some writers, but not by Eichwald.

Myospalax fuscocapillus, Blyth, J. A. S. B. xv, p. 141, described from Quetta, in Southern Afghánistán, may probably be found in parts of Eastern Persia.

58. Nesokia Huttoni, Blyth, Pl. VI, fig. 1.

J. A. S. B. xv, p. 139, (1846), and xxxii, p. 332.
N. Hardwickei, Jerdon, Mammals of India, p. 190, partim, nec Gray.

1–9.	Kalagán, Balúchistán	3500

My specimens agree very fairly with Mr. Blyth's description, but they are rather larger. They are not, however, the same as Gray's *Nesokia Hardwickei*, which is a larger animal with a much shorter tail, and with which I believe that *N. Griffithii*, Horsfield, is identical. The type of the latter is in the India House Museum and inaccessible.

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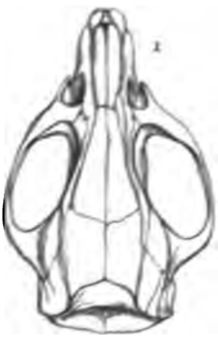
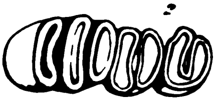
[1] Very nearly 6 inches. [2] 3.75 in. [3] 1.1 in.

The colour of the specimens obtained by me varies from ferruginous brown to sandy brown above. The lower parts are isabelline, but frequently appear dark in consequence of the fur being thin and worn; the basal portion is dark slaty grey both above and below the animal. Hairs on the back soft and of moderate length, a very few black hairs being scattered amongst the brown ones. Tail naked and ears almost naked, the latter having only a few extremely short hairs thinly scattered, and the feet being covered above very sparsely with short whitish hairs.

The mammæ are only six in number, one pair being pectoral, two pairs inguinal. The crown of the first molar in each jaw consists of three subequal transverse ridges, the second and third of two each. These ridges are parallel, close together, and all separate except in the last molar of the upper jaw, in which they are joined together inside, and in the first molar of the lower jaw, in which the first and second ridges are united outside. The incisors are very broad, and are not grooved.





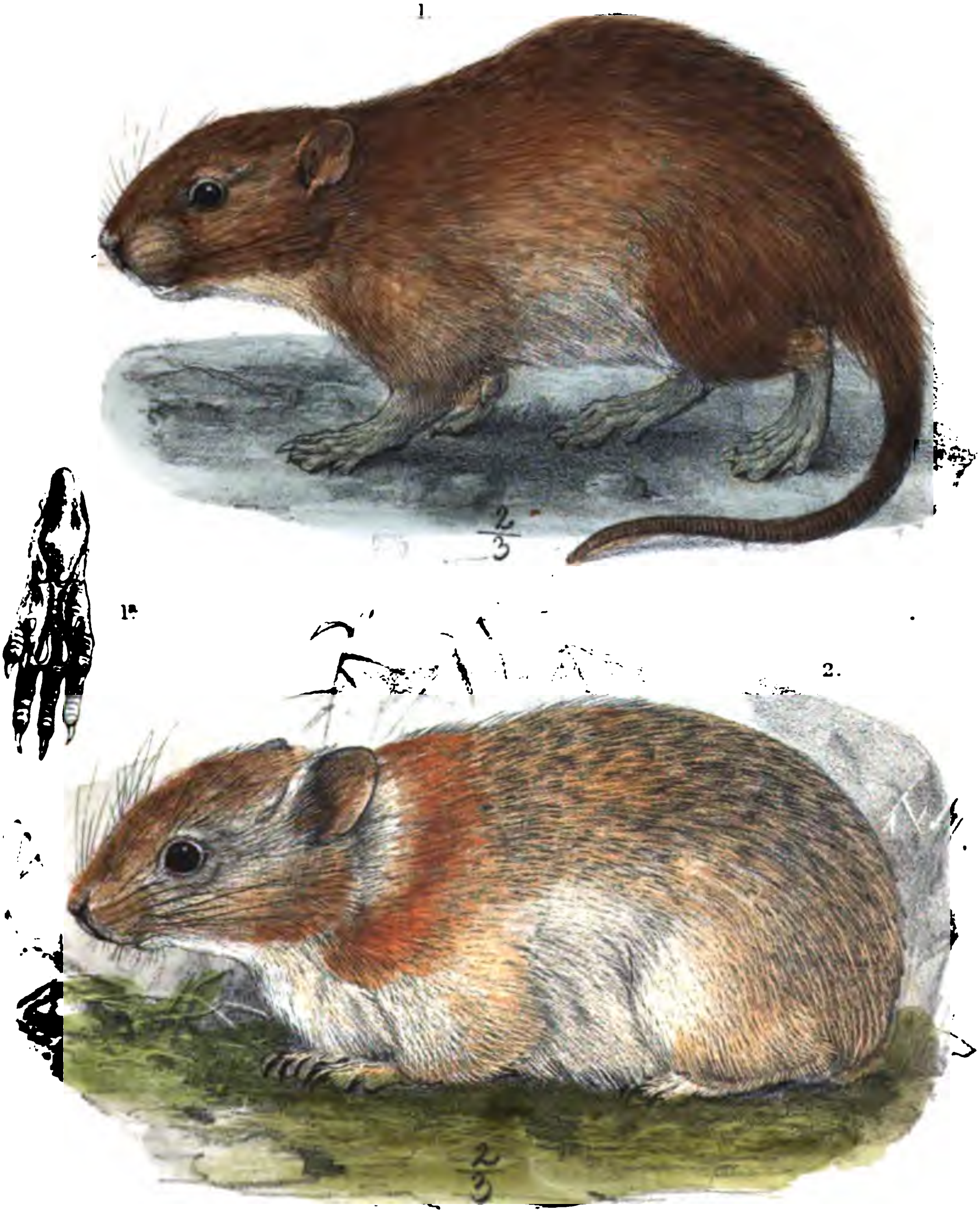
1. Skull of *Nesokia Huttoni*, nat. size,.
2. Molar teeth of the upper jaw, enlarged three diams.

The following measurements were taken on fresh specimens, all adults:—

	♂	♂	♀	♀
Length of head and body, from nose to anus	6.75	7	6.65	6.7
Length of head alone	1.75	1.8	1.85	1.78
Length of tail	4.9	4.6	4.75	4.9
Total	11.65	11.6	11.4	11.6
Length from shoulder to rump	5	4.25	4.75	4.9
Height of ear from orifice	0.73	0.7	0.67	0.75
Breadth of ear laid flat	0.55	0.55	0.5	0.56
Length of longest whisker	1.75	1.72	1.58	1.73
Length of fore foot (palma and nails) ..	1	0.9	0.85	0.83
Length of hind foot (planta and nails) ..	1.53	1.6	1.45	1.5

The distance from the ear to the eye (average of 3 specimens) is 0.81, from the eye to the end of the snout, 0.72; diameter of the eye 0.23; length of the middle toe of the fore foot, 0.45; of the hind foot, 0.5 in. The skull of an adult female measures 1.65 inches in length from the *foramen magnum* to the end of the nasals, and 1.08 in breadth

Pl. VI.
Zoology of Persia.



G Keulemans del.

Mintern Bros imp.

1 NESOKIA HUTTONI
2 LAGOMYS RUFESCENS

across the widest part of the zygomatic arches. The upper molars are 0.35 inches in length.

This animal is said to burrow in sandy ground and to be found both in cultivated and uncultivated tracts. The country in which I obtained specimens consists chiefly of barren hills.

59. *Arvicola amphibius? L.—De F.

Arvicola amphibius, L. var. *Persica*, De F. Viag. in Persia, pp. 196, 344.

I once or twice saw a small animal resembling the common water rat of Europe on the banks of streams in the Elburz, but I could not obtain a specimen. De Filippi was more fortunate; he procured two skins at least, one of an adult, the other of a young animal, now in the museum at Turin. He says that the osteological characters are identical with those of the European *Arvicola amphibius*, but that the colour differs, passing into fulvous on the flanks, and into white on the under parts. It appeared to me, on comparing the skins at Turin with European specimens, that the former belonged to a distinct race, the fur being shorter, much less close and less woolly. On the back it is slaty black at the base, isabelline near the end, with black tips. Below the colour is paler than in European specimens, the whitish under parts differing more in colour from the brown back, and the line of division between the two colours being much more sharply defined. The size appears to be the same.

De Filippi met with this water vole at Sultániah and other places. He says it is found along irrigation channels, entering gardens and even houses.

60. *Arvicola mystacinus, De F.

Viag. in Persia, pp. 255, 344.
? *Mus micrurus*, S. G. Gmelin, Reise d. Rüssl, iii, p. 500, Pl. LVII, 2.
? *Arvicola socialis*, Mén. Cat. Rais. p. 23 (an Pall. ?).

This is described in the following terms by De Filippi:—

'A. arvali *affinis, sed auriculis et mystaciis longioribus, cauda breviore, facile distinguendus.*'

'Allied to *A. arvalis*, from which, however, it is distinguished by much larger ears, which project more above the fur, by its whiskers of white and black hairs mixed, the former, which are by far the longer, when laid along the side of the head, reaching to the outer edge of the ear, and by its much shorter tail, which measures only a sixth of the whole body.

'Colour above mouse grey, paler below.'

There are four specimens of this little vole in the Turin Museum, all of the same size and apparently adult, three being in spirit and one stuffed. My notes on the colouration and dimensions differ slightly from those of De Filippi. The colour above is rufous brown, the hair as usual being blackish slaty at the base, and about $\frac{4}{10}$ of an inch long in the middle of the back, lower parts white. The fur is soft. The following are the dimensions taken from a specimen in spirit:—

	In.
Total length including tail	3.5
Tail from anus	0.75
Fore foot (palma)	0.37
Hind foot (planta)	0.58

De Filippi found this small rodent abundant in the valley of the Lár, north-east of Tehrán in the Elburz mountains, where he says the ground in places is full of its holes.

At Ujún, a camping ground, about 8000 feet above the sea, between Dehgirdú and Kushkizard, on the summer road from Shiráz to Isfahán, I saw a small mouse or vole in large numbers, the ground in one place being covered with its holes, but I failed to obtain specimens. It may perhaps have been the present species.

61. *A. socialis, (Pall.)

Mus socialis, Pall., Schreb. Säugth. iv, p. 682.
Myodes socialis, Pall. Zoogr. Ros. As. i, p. 176.

Pallas's description is very brief. Schreber's is better. He says *A. socialis* is distinguished from *A. arvalis*, Pall. by its colour (pale yellowish above, the ends of the longer hairs partly brown, still paler on the sides; lower parts, feet, and tail white), its white ears (? misprint for tail) and feet, which have no scales, its shorter tail and thicker head. Length of head and body, 3 inches 5 lines, tail 9⅛ lines, or with the hair at the end 10⅜.

Mus micrurus of the younger Gmelin is united to Pallas's species by Schreber, J. F. Gmelin, and others. According to S. G. Gmelin's description it is from ashy to dark grey with some yellowish mixed above, greyish white below, the hairs black at the base. Length of head and body, 3 inches 3 lines, tail 6 lines.

Arvicola socialis is said by Pallas to be found in sandy countries round the Caspian Sea as far as Persia. Ménétries gives it as common in the Tálish mountains, living under stones.

For want of specimens I cannot clear up the account of these voles, but I suspect that De Filippi's *A. mystacinus*, Ménétries' *A. socialis*, and S. G. Gmelin's *Mus micrurus* are the same animal, a small vole inhabiting the Elburz at considerable elevations, and that Pallas's *Mus* or *Myodes socialis* is another similar vole, but distinguished by its white tail, found on the shores of the Caspian. By J. F. Gmelin, Syst. Nat. i, p. 134, *A. arvalis*, Pall. is also said to inhabit Persia, but Gmelin is about as untrustworthy an authority, especially on localities, as could easily be quoted.

Unless the animal seen at Ujún belonged to this genus, no *Arvicola* has as yet been observed in Central or Southern Persia.

62. Gerbillus[1] Indicus, (Hardwicke.)

Dipus Indicus, Hard. Trans. Linn. Soc. viii, p. 279, Pl. VII.
Gerbillus Indicus, Blyth, J. A. S. B. 1863, xxxii, p. 327.—Jerdon, Mammals of India, p. 184.—F. Cuv. Tr. Z. S. ii, p. 143, Pl. XXV, fig. 15-19, skull.
G. Hardwickei, Gray, Cat. Mam. B. M. p. 132.
Meriones Indicus, Wagner, Schreb. Säugth. iii, p. 472.

1–8. Píshín, Balúchistán 700

I can see no essential difference between the specimens procured at Píshín and some Indian skins in the British Museum. Jerdon, however, gives the length of the hind foot as 2 inches, which is much more than in the animals obtained by me. *G. Cuvieri*, Waterhouse, (P. Z. S. 1838, p. 56,) the Southern Indian form, has a longer tarsus, but Blyth doubts if it be really distinct.

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[1] Concerning the genus *Gerbillus*, and its allies, resecting which much confusion exists in the works of both German and English writers, compare Brandt, Bemerkungen über die Gattungen *Gerbillus*, *Meriones*, *Rhombomys* und *Psammomys*, Bull. Acad. Sci. St. Pet. ii, 1844, p. 76. He there states that the crowns of the molar teeth in *Gerbillus*, Desmarest (= *Meriones*, Illiger and Wagner, nec F. Cuvier) are composed of distinct transverse ridges, the first molar having 3, the second 2, the third 1; that the incisors are grooved down the middle, and there is no tubercle on the outside of the lower jaw below the condyle.

Meriones, Illiger (= *Rhombomys* partim, Wagner), has the crowns of the molars composed of transverse ridges, those of each tooth being joined by a longitudinal process in the middle, the incisors are grooved down the centre, and there is a well marked tubercle below the condyle of the lower jaw.

Rhombomys, Wagner, apud Brandt, differs from *Meriones* and *Gerbillus* in having the posterior molar tooth of the upper jaw composed of two transverse ridges instead of one. In the species selected as the type, *Meriones opimus*, Licht. (= *M. tamaricinus*, Evers. nec Pall. = *Rhombomys pallidus*, Wagner), the upper incisors, besides the groove down the centre, have a second imperfect groove or depression down the inner margin.

The general colour of the upper parts is bright rufous brown or fawn colour, many of the hairs being tipped with black. Forehead the same colour as the back. Immediately round the eye is dark brown, the area of this colour being prolonged in front and behind; above is a distinct white supercilium, and below there is also a white band, much more marked in some specimens than in others: the hinder parts of the cheeks are rufous, becoming paler in front. The ears are very thickly covered outside with short, brown hair, within they are nearly naked. The whiskers are black above, white below. The tail is longitudinally banded, being pale along both sides, brown above, and with a narrow brown band below; the whole becomes dark brown or black, and the hairs longer, near the tip. Feet white above, naked and flesh-coloured below.

The fur is soft and fine; the underfur on the back is leaden grey. There are four pairs of mammæ, two pectoral, and two inguinal.

In *Psammomys* the upper incisors are not grooved in the centre.

On this I must remark that the skull of *Gerbillus Africanus*, figured by Brandt, is that of a young animal; that in some species of jerboa rats, e. g. *G. Indicus*, I find that the transverse ridges of the molars are at first distinct, but subsequently, when more worn, they are united in the middle of the tooth; finally, in very old animals they disappear altogether. Consequently, the form of the ridges of the molar teeth is not a good generic character.

Secondly, in *Gerbillus Indicus*, which Brandt, from the figure of the skull given by F. Cuvier, Zool. Trans. ii, Pl. XXV, f. 15–19, refers to *Rhombomys*, the presence of a small additional ridge or talon on the posterior upper molar can only be detected in the young. The two ridges soon coalesce, the surface becoming trilobate, and I have no doubt but that, if very young specimens be procured, a similar rudimentary posterior ridge will be found in several other species. In fact a series might be formed showing its gradual increased development. It is a good specific distinction, but scarcely of generic importance.

Lastly, in the only African forms of *Gerbilli* of which I can find skulls in the British Museum, viz. *G. melanurus* and *G. montanus* (neither of which, however, is included by Brandt in his restricted genus *Gerbillus*), there is a tubercle in front of the condyle of the lower jaw. Its absence, however, in the specimen of *G. Africanus* figured by Brandt, can scarcely be due to immaturity, at least I find it well developed in a young *G. erythurus*.

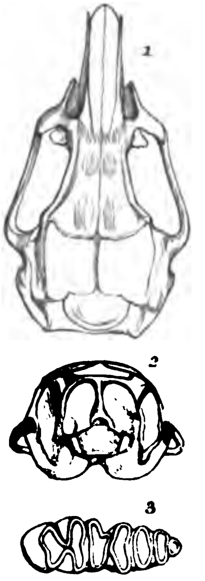
I prefer therefore, for the present, to refer all the Persian forms to *Gerbillus*. This name was proposed in 1804 by Desmarest in the Tableau Méthodique, vol. xxiv of the Dictionnaire d'Histoire Naturelle, and has therefore priority over *Meriones* proposed by Illiger in 1811. The latter name is preserved by most German naturalists, partly, I believe, because it is considered classical.

Dimensions of adult fresh specimens in inches :—

	♂	♂	♀	♀
Length from nose to base of tail ..	7	6.4	6.5	6.
Length of tail to end of vertebræ	7	7	6.5	5.5
Length of hairs at end	0.5	0.5	0.5	0.5
Total	14.5	13.9	13.5	12
Length from shoulder to rump ..	5.25	4.75	4.75	4
Length of head	1.95 .	1.95	1.9	1.6
Height of ear from orifice ..	1.1	1.05	1	0.92
Breadth of ear not laid flat ..	0.55	0.57	0.55	0.54
Length of fore foot, including nails	0.55	0.45	0.45	0.36
Length of hind foot, including nails	1.57	1.5	1.46	1.43
Length of longest whisker ..	2.1	2.35	2.1	

The breadth of the ear laid flat in a specimen in spirit is 0.68; length from orifice one inch. The diameter of the eye is 0.35 in fresh specimens. A woodcut of the skull and molar teeth is given, for comparison with those of the allied species described below.

I only obtained this species at one locality, a rather well wooded valley in Balúchistán.



1, 2. Skull of *Gerbillus Indicus*, nat. size.
3. Molar teeth of upper jaw, magnified three diams.

63. *G. tæniurus? Wagner.

Wagner, Schreb. Säugth. ed. 2^a. iii, p. 471.

A large specimen of a *Gerbillus* in the British Museum, brought from the mounds of Susa, in Khúzistán, lower Euphrates valley, by Mr. Loftus, closely resembles *G. Indicus*, but appears larger, with a comparatively shorter tail. The skull differs in having the upper surface more convex behind, the anterior or upper portion of the supraoccipital bone sloping away, for a short distance at least, behind the posterior edge of the interparietal, instead of being bent sharply downwards, immediately behind the suture, as it is in *G. Indicus*. The interparietal too in the Susa specimen is broader, and the auditory bullæ appear considerably smaller.

The tail is dark brown above and below, with a pale band along each side, as in *G. Indicus*. *G. tæniurus* is described by Wagner as having the pale band above and below. The colouration of the Susa animal differs in no important particular from that of *G. Indicus*; its dimensions agree with those of *G. tæniurus*.

Length of skin 8 inches, tail (vertebræ preserved) 6.5, hairs at end 0.5, ear from orifice 0.9, breadth of ear laid flat 0.7 (both these measurements would be more in a fresh specimen), hind foot from tarsal joint to end of claws 1.65. Skull 1.75 inches long to end of nasal bones, nasal bones 0.73 long.

It is possible that this may be only a variety of *G. Indicus*.

64. G. Persicus, sp. nov. Pl. VII, fig. 1.

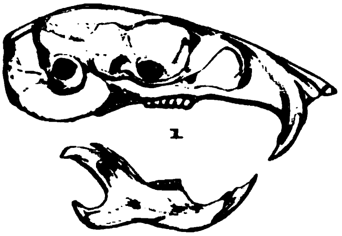
1, 2.	Near Karmán, Southern Persia	5000
3, 4.	Kohrúd, north of Isfahán	7000

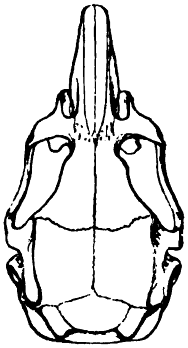
G. *affinis* G. Indico, *supra ferrugineus, infra albus; caudá corporem longitudine excedente, superne rufescenti-brunneá, apicem versus nigrá, subtus albidá, ad latera haud pallide striatá; auribus elongatis, sed minoribus quam in* G. Indico, *parum pilosis; plantis latioribus, subtus sordide viridescentibus; mystacibus longioribus confertioribusque; dente molario superiore postico in adultis simplicè rotundato.*

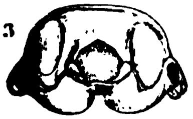
Hab. in Persiá.

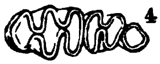
This species is very similar in appearance to *G. Indicus*. My specimens are rather darker in colour than individuals of the latter from Pishin, but there is even greater difference in some specimens of *G. Indicus* from India. The essential external differences are that there is no dark line along the lower surface of the tail in *G. Persicus*, that the feet are broader, and with the soles somewhat differently coloured, being of a dusky greenish tinge below, and that the whiskers are longer and more numerous. The present species has soft fur; the upper parts are rufous, the hairs being slaty grey near the base, and tipped with black, lower parts white, the two colours divided by a distinct line on the flanks. There is a whitish superciliary mark, and the whiskers are black behind and white in front. The tail is rufous brown (the hairs rufous with black tips) above, white below, ears very thinly clad with hair, mammæ eight, as in *G. Indicus*. The soles of the feet are naked.

The skull differs from that of *G. Indicus*, in having the nasal portion narrower, in the zygomatic arch being curved upwards near its posterior extremity, and in the very different form of the back of the skull when viewed from behind. It is much higher in proportion to its breadth in *G.* [illegible], in which the distance from the top of the *foramen magnum* to









1, 2, 3. Skull of *Gerbillus Persicus*, nat. size.
4. Molar teeth of upper jaw, magnified three diams.

the upper surface of the skull at the highest part of the occipital crest exceeds the height of the *foramen magnum* itself, whilst in *G. Persicus* the first named measurement is less than the height of the *foramen*. The hindmost molar too in the upper jaw appears to want the posterior rudimentary transverse ridge or talon seen in *G. Indicus*, traces of which are easily seen in the shape of the tooth, even when it is much worn down. If found in young specimens of *G. Persicus*, it must be much less developed than in *G. Indicus*.

The length of a skull taken from an adult female from Kohrúd is 1.75 inch, the breadth across the hinder part of the zygomatic arches 0.9, that of the frontal bones behind the postorbital processes 0.2, length of the nasal bones 0.72, and length of the lower mandible from the condyle to the inner base of the rodent tusks 0.9.

The following are the measurements taken on two fresh specimens obtained at Kohrúd:—

	♂	♀
Length from nose to root of tail	6.25	6
Length of tail (vertebræ)	6.5	7.3
Length of hairs at end	1	1
Total	13.75	14.3
Length from shoulder to rump	4	4
Length of head	1.75	1.85
Height of ear from orifice	0.85	0.95
Breadth of ear laid flat	0.65	0.7
Length of fore foot, including nails	0.6	0.5
Length of hind foot, including nails	1.55	1.55
Longest whisker	2.4	2.85

Diameter of the eye 0.32 in.

I did not myself see this animal, living, at Kohrúd; the specimens killed near Karmán were found towards dusk amongst small bushes in barren stony ground. Like *G. Indicus*, it is nocturnal or crepuscular in its habits, and very much shyer than *G. Hurrianæ* and *G. erythrurus*. Major St. John informs me that he has seen it at Kohrúd, about the stone walls dividing the orchards and gardens, and also at Abádeh, between Shiráz and Isfahán.

In the British Museum is a specimen brought from Persia (no exact locality has been preserved) by Mr. Loftus, which, though near the present form, shows some differences. The fur is remarkably soft, the ears rather small, and the feet decidedly shorter. The stuffed specimen measures, head and body about 5½ inches, tail the same, ear from orifice 0.55, hind foot and tarsus 1.2.

65. **G. Hurrianæ**, Jerdon.

Mammals of India, p. 186.
G. erythrourus, Jerdon, ibid. nec Gray.
♀ 7. Dasht, Balúchistán.
♂ 10. Báhú Kalát, Balúchistán.

This form agrees well with Jerdon's description of the 'desert jerboa-rat' of Harriána, Kachh, and Sind, and with specimens of the same in the British Museum. Jerdon considered it to be the *G. erythrurus* of Gray, but that is clearly a distinct species, with much larger ears, and a black tip to its tail. In case of the present species proving distinct, Jerdon proposed to call it *G. Hurrianæ*, which name it must bear.

Jerdon's description of the colouration is excellent. Above, the fur is sandy brown, the hairs being short, dark slaty at the extreme base, isabelline near the point, with short dusky tips. A few longer black hairs are mixed with the others on the hinder part of the back and thighs. Lower parts whitish, this colour passing gradually on the flanks into the brown of the back. Tail the same colour as the back, scarcely paler below, a line of dusky brown hair along the upper surface of the terminal portion, becoming longer near the tip. Ears very small, round, thinly covered with short hair outside (more thickly near the anterior edge), and near the hinder margin within. Whiskers black above and white below, of moderate length. Feet pale coloured, the hind feet thinly covered with whitish hair below, except on the posterior half of the tarsus; soles of fore feet naked. The head is shorter and more rounded than in *G. Indicus*; mammæ eight, as usual in the genus, two pairs pectoral, two inguinal.

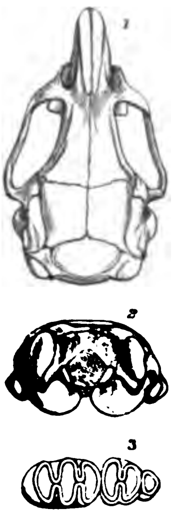
Dimensions of fresh specimens, both males, taken at Dasht :—

	In.	In.
Length from nose to base of tail ..	5.6	5.25
Length of tail to end of vertebræ	6	5.3
Length of hairs at end of tail	0.6	0.7
Total	12.2	11.25
Length from shoulder to rump	4.25	3.75
Length of head	1.6	1.47
Height of ear from orifice	0.5	0.48
Breadth of ear laid flat[1]	0.35	0.35
Length of fore foot, including nails	0.45	0.6
Length of hind foot, including nails	1.35	1.35
Longest whisker	2	2.2

The upper surface of the skull is longitudinally very convex, and the nose short. The hind upper molar has no vestige of a second ridge, even in immature specimens. Even in a young skull, the transverse ridges forming the crowns of the molar teeth are united in the middle, so this species would be referred to *Meriones*, Illiger apud Brandt, or *Rhombomys* of Wagner (see note to p. 63).

The following are measurements of the skull in inches :—

	♂	♀
Length to end of nasal bones	1.5	1.42
Breadth across hinder part of zygomatic arches	0.9	0.83
Breadth of frontal bones behind postorbital processes	0.3	0.29
Length of nasal bones	0.54	0.53
Length of lower jaw from condyle to inner base of rodent tusks	0.84	0.77



1, 2. Skull of *Gerbillus Hurrianæ*, nat. size.
3. Molar teeth of upper jaw, enlarged three diams.

The habits of this species have been well described by Jerdon. It is diurnal in its habits, being seen outside its holes at all hours of the day in the cold season. It lives in burrows, usually at the roots of bushes, and is found in enormous numbers in the semi-desert plains of North-western India. It appeared common in the sandy plains of Balúchistán, near the sea, but less abundant than in Sind and Kachh.

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[1] This measurement is taken from specimens in spirit, and would be rather more on fresh individuals.

66. G. erythrurus, Gray.

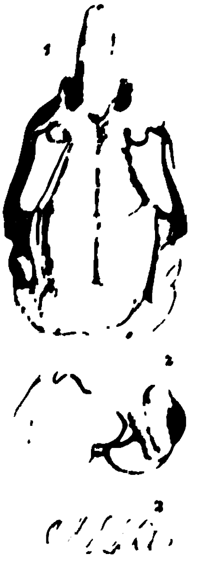
Gray, Ann. Mag. Nat. Hist. 1842, ser. 1, vol. x, p. 266, (nec Jerdon).

1–5. Shiráz, Southern Persia 4700

I did not procure this form myself. The specimens were obtained by Major St. John, and all sent to me from Calcutta, unfortunately, are skins, so that I can only give approximate measurements. The skulls, however, are with the skins.

I have compared this form with the types in the British Museum, and I have no doubt of their identity. The original specimens are two in number, marked 'Sullebad,' one is also marked Kila-i-Ghilzee[1]. There are also skins of the same species, apparently, from Kándahár, presented by Captain Hutton, which agree admirably with those from Shiráz, the skulls as well as the skins being precisely similar. It is evidently an Afghánistán species extending into Persia.

From *G. Hurrianæ*, which Jerdon thought might probably be the same, the present form is distinguished by its much larger ears, and by the hind feet, and especially the toes, being more thickly covered with hair beneath. The fur too is longer, and the colour browner on the back, the tail is more rufous, and the tip blacker. The skull is larger and broader, the nasal portion more elongate and less concave above, and the hind upper molar has a distinct talon, or rudimentary second transverse ridge, in young specimens, traces of which may be detected in the form of the worn tooth. The crowns of the molars are formed of transverse ridges, united at the centre, even in young animals.



1, 2. Skull of *Gerbillus erythrurus*, nat. size. 3 Molar teeth of upper jaw, magnified three diams.

The general colour above is rather rufous brown, the hairs being slaty at the base, a few long black hairs are scattered amidst the others, and are more numerous on the rump and thighs. Lower parts white, passing gradually into the colour of the back. Tail very rufous brown, black hairs being scattered through the upper surface, none below; towards the end a band of black hairs commences on the upper surface, and covers the whole tip, where the hairs are longer than elsewhere. Ears covered with hair outside, and near the margin inside. Soles of hind feet and toes pretty thickly covered with hair, except on the hinder half of the tarsus.

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[1] Near Kándahár. I cannot find any place named Sullebad on the map of Afghánistán; can it be a misreading for Jalalabád?

In the skins before me the head and body measure about six inches, tail the same, ear about 0.65 high, 0.4 inch broad. In a fresh specimen these dimensions, especially that of the ear, would in all probability be more; the ear would probably measure about three quarters of an inch. It is, however, clearly much smaller than in *G. Indicus*.

The following are the dimensions of two skulls, both marked as those of males:—

	In.	In.
Length to end of nasal bones	1.62	1.63
Breadth at hinder portion of zygomatic arches	0.9	0.92
Breadth of frontal bones behind postorbital processes	0.3	0.31
Length of nasal bones	0.65	0.65
Length of lower jaw from condyle to inner base of rodent tusks	0.85	0.87

Both in this and the preceding species I am indebted to the kindness of Dr. Günther, who has had the skulls extracted from the types in the British Museum, to enable me to compare them.

Major St. John informs me that this species is abundant at Shiráz, and in the plain of Persepolis, not extending to the watershed of the Persian Gulf, nor found at a much greater elevation than 5000 feet above the sea. Its habits appear similar to those of *G. Hurrianæ*, well described by Jerdon. It is not very shy, being found close to habitations, and it is often seen sitting near the entrance of its burrow, whilst men pass at a few yards' distance. It is diurnal, being usually seen out during the day. It lives in burrows, usually in banks, or at the roots of tamarisk and other trees, and is found both in uncultivated semi-desert, and in cultivation.

67. *? **G. tamaricinus** (Pall.)—De F.

Meriones tamaricinus, (Pall.), De F. Viag. in Persia, p. 344.

De Filippi states that this species is found throughout Western Persia, and that it was also taken at Shiráz by Marquis Doria. The identification of the Shiráz specimens I doubt; they were more probably, I think, *G. erythrurus*, but it is far from improbable that *G. tamaricinus* is found in Adarbaiján. I omitted to notice if there were any specimens in Turin.

G. tamaricinus is evidently a very distinct species from *G. erythrurus*. It has the tail shorter than the body, and marked with dark rings, and is described as greyish lutescent. It is much to be desired, however, that specimens from North-western Persia should be compared, De Filippi's identifications being sometimes incorrect.

Another species, *G. meridianus*, Pall., is found on the shores of the Caspian, and may be Persian.

68. G. nanus, sp. nov. Pl. V, fig. 1.

1, 2. **Samán, Dasht, Balúchistán.**

G. *parvus, longicaudatus; caudá corporis longitudinem duplam æquante; supra cervinus, infra albus; genis superciliisque albidis; caudá superne brunneá, subtus albescente, apice vix fuscescente, pilis parum elongatis; auribus mediocribus, fere nudis; mystacibus* (*vibrissis*) *plerumque albis, superis ad basin fuscis. Long. capitis cum corpore* 2.6, *caudæ cum pilis apicalibus* 5, *auris* 0.45, *plantæ* 0.9, *poll.*

Hab. in Gedrosiá.

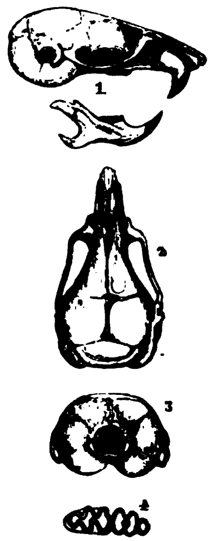
The fur is soft and long, rufous brown or fawn colour above, white below, the colours being less sharply distinguished than in *G. Indicus*: the hairs of the upper parts have no black tips, and the basal two thirds are slaty grey. There is a broad white supercilium, in front joining the white area of the sides of the face, so that the brown of the nose is reduced to a rather narrow band. Ears almost naked, a few short whitish hairs near the edge only. Whiskers nearly all white, a few of the upper hairs brown near the base. Feet white above, naked beneath. Tail light brown above, whitish beneath, towards the end a band of darker brown hairs runs along the upper portion, those at the end lengthened, but there is a less marked tuft than usual, and there are no black hairs at the end.

When I first obtained the two specimens of this species, I thought they were the young of *G. Indicus*, and I omitted to take their measurements. The following dimensions are those of a male specimen preserved in spirit. An examination of the epiphyses of the limb bones, and of the skull of the other specimen, shows it to be fully adult, and the two agree in proportions.

	In.
Length of head and body	2.6
Length of tail to end of vertebræ	4.5
Length of hairs at end of tail	0.55
Total	7.65
Height of ear from orifice	0.45
Breadth of ear laid flat	0.3
Length of fore foot (palma), including nails	0.32
Length of hind foot (planta), including nails	0.9
Longest whisker	1.5

The skull of a female measures 1.05 in length to the end of the nasal bones, 0.55 in breadth across the posterior portion of the zygomatic arches, length of nasal bones 0.4, breadth of frontals where narrowest 0.19, length of lower mandible from the condyle to the inner base of the rodent tusks 0.52. The general form of the skull approaches most nearly to that of *G. Persicus*, the nasal portion being longer and straighter than in *G. Hurrianæ* and *G. erythrurus*.

Only the two specimens obtained were observed. They were captured, together with many of *G. Hurrianæ*, in consequence of a large area of ground being flooded, and these jerboa rats being driven from their holes, by a sudden storm of rain.



1, 2, 3. Skull of *Gerbillus nanus*, nat. size.
4. Molar teeth of upper jaw, magnified three diams.

This species is near *G. longicaudatus*, Wagner, but evidently much smaller, and with a still longer tail; an immature specimen of Wagner's species measuring: the body round the curve 3″ 1‴, the tail, with the hair at the end, 4″ 6‴. Wagner's species moreover is founded on *Meriones gerbillus*, Lichtenstein (nec Rüppell), which was said to have a body four inches long, and a tail 6″, tarsus 8‴.

A still more closely allied form is a little species, which is extremely common on the Abyssinian coast, and which, in my 'Geology and Zoology of Abyssinia,' I, perhaps incorrectly, identified with *Dipus gerbillus*, Oliv. One of the skins collected by me is in the British Museum; the body appears about the same size as that of *G. nanus*, and the tail vertebræ measure 4.5 inch. It is of a bright fawn colour above, white below.

FAMILY DIPODIDÆ.

69. Dipus macrotarsus? Wagner.

Abhandl. Bayerisch. Acad. Wiss. iii, p. 214, Pl. IV, f. 2.

1. Near Káın (Kúm), between Isfahán and Tehrán .. 3000?

A single female specimen, scarcely full grown, of a true jerboa, obtained by my collector at the above locality, agrees in most of its characters with Wagner's description of the above species, of which the type came from Sinai. The tarsus is rather longer in the Persian specimen, and there are the following differences in colouration, as compared with Wagner's figure and description. The long hair beneath the hind feet is black, and there is a dusky patch at the outside and hinder part of the thigh, just at the lower end of the fleshy portion, whilst the white band appears to be larger, and to cross the upper part of the thigh. The whiskers too are much longer, but this may be due to the longest, as frequently happens in skins, having been lost in Wagner's specimen. If the above differences are constant, the Persian form is distinct, but as the distinctions are small, I do not like to propose a name for it on the strength of a single specimen, without comparison with Wagner's type. The tail in the latter was imperfect. The following is a description of the specimen from Kúm:—

Colour above pale rufous brown, below white. Fur soft, rather long, that on the back ashy grey at the base, fawn coloured near the end, with very short black tips. Whiskers black, very long; the longest extending nearly to the root of the tail, and white-tipped. Head above of the same colour as the back, whitish at the sides, with some black hairs below the eye. Ears moderate, rounded, very thinly clad with short hair outside and in, except outside near the anterior margin, where the clothing is much thicker, and there is a fringe of longer hairs along the edge. Tail light brown above, whitish below, except for about two inches at the end, where the hair is longer and black; the extreme tip, ¾ inch long, being white. Fore legs white, the claws long and white. A broad whitish band across the upper part of the thigh outside, below this the colour is fawn, passing into brownish ashy outside and behind just where the muscular portion terminates. Tarsus and feet clothed with hair throughout, white above and at the sides, brown below the tarsus, the hair at the sides of the feet and below is about half an inch long, that at the sides and towards the ends of the toes beneath is white, that below the soles black. Claws horny. Incisors white, the upper ones grooved; molars three on each side of each jaw, those on the upper jaw all biplicate, both inside and out, the second molar in the lower jaw triplicate outside, biplicate within, the first and third biplicate within and without. The length of the skull from the upper edge of the *foramen magnum* to the end of the nasal bones is 1.27 inch, from the lower edge of the *foramen magnum* to the front of the upper incisors 1.1, breadth across hinder part of zygomatic arches 0.85, ditto of frontal bones where narrowest, just behind the postorbital processes, 0.5, length of lower jaw from condyle to inner base of incisors 0.72. As before remarked, the specimen is not adult, the hinder molars not being fully grown.

The following dimensions are taken from the specimen preserved in spirit:—

	In.
Length from nose to root of tail	3.9
Length of tail	6.6
Length of hairs at end of tail	0.75
Total	11.25
Height of ear from orifice	0.65
Breadth of ear laid flat	0.5
Length of tarsus and hind foot to end of claws	2.65
Length of fore foot to end of claws	0.6
Longest whisker	3.4

This species is allied to the African *D. hirtipes*, Licht., but distinguished by its shorter and more rounded ears, and much longer tarsus.

70. * Dipus Loftusi, sp. nov. Pl. VII, fig. 2.

D. *supra fusco-isabellinus; pilis mollissimis, basin versus pallide griseis, ad uropygium duntaxat nigro terminatis; subtus albus; femore extus fasciá latá albá transversá signato, postice haud fusco; mystacibus brunneis; auribus rotundatis, mediocribus, intus extusque pilis sparsim indutis; caudá supra brunneá, subtus pallidá, apicem versus nigrá, albo-terminatá.*

Long. corporis cum capite 5–6, *vertebrarum caudæ* 6, *pilorum ultra* *apicem* 0.75, *auris* 0.75, *tarsi cum pede posteriore* 2, *poll. Angl.* (*dimensionibus ad corium siccatum mensis*).

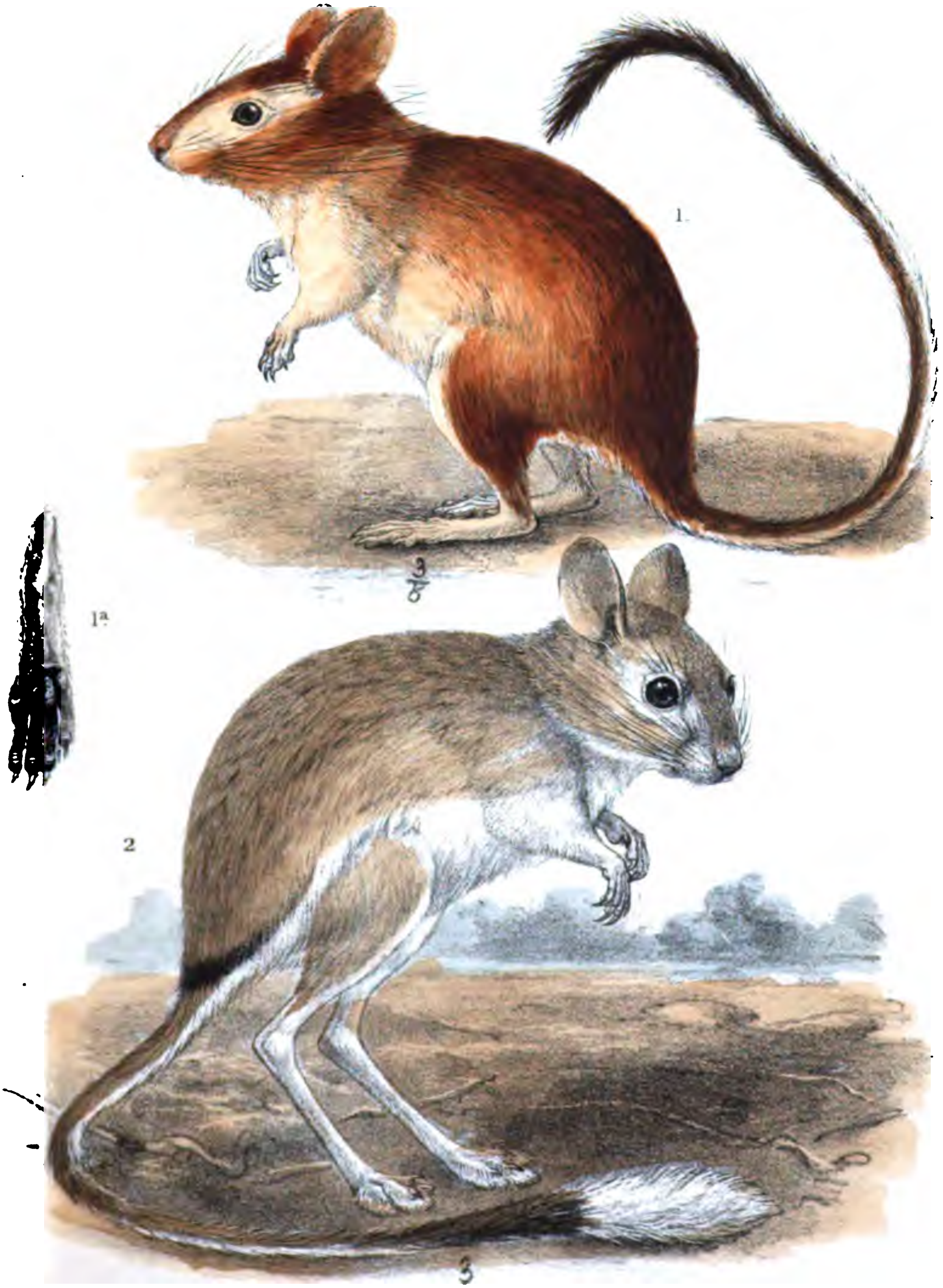
Hab. ad Mohamrah in Mesopotamiâ (Loftus).

Two specimens in the British Museum, forming part of the collection brought by Mr. Loftus from Persia, belong evidently to a very different species from that obtained in Northern Persia. Although larger, they have much shorter tarsi, the ears are longer even in the dried skins, and there is no black hair beneath the hind feet. The following is a description:—

Colour pale sandy brown above, white below, the two colours not passing into each other. The fur is very soft, the hairs on the back are light lilac grey at the base, and have no black tips, except on the rump; even there the dark tips are very short. There is the usual white patch on the outside of the thigh; it extends completely across. The lower part of the thigh outside and behind is brown; there is no dusky or blackish patch posteriorly. The sides of the nose and space around the eyes are whitish; the whiskers are brown, and appear much shorter than in most species of the genus, but this may of course be due to the longer hairs having been lost. The ears are of moderate size, rounded, and thinly covered with hair inside and out; on the edges, and especially the anterior edge, the hair is rather longer. Legs and feet nearly white, the long hair below the hind feet whitish. The tail is brown above, paler beneath. Near the end of the tail the hair is longer and black above, there is very little or no black hair below, the extreme tip, ¾ inch long, being white, the black portion is about 1½ inches long. The stuffed specimens measure: length of head and body five to six inches, tail (vertebræ preserved) 6, hairs at end 0.75, total length about twelve inches; ears 0.75 long (in fresh specimens probably 0.9 to one inch), tarsus and hind foot 2 inches. The mid toe on the hind foot exceeds the outer by barely half the length of the claws.

The skull is smaller than that of the North Persian form, but belongs to the same type (subgenus *Scirtopoda*, section *Haltomys*, of Brandt, Bull. Acad. Sc. St. Pet. xiv, 1856, p. 215), having the upper incisors grooved, the molars three on each side of each jaw, those in the upper jaw biplicate both inside and out, the posterior molar less distinctly so on the inner side, the second molar in the lower jaw triplicate outside, biplicate within, the others biplicate on both sides. The skull (which has been extracted for me by Mr. Gerrard) is somewhat broken

Pl. VII
Zoology of Persia.



J G Keulemans del.   Mintern Bros. i

1 GERBILLUS PERSICUS.
2 DIPUS LOFTUSI.

behind; it measures 1.05 inches from the lower margin of the *foramen magnum* to the front of the upper rodent tusks, and 0.42 across the frontal bones where narrowest, just behind the postorbital processes. The length of the nasal bones along the median suture is 0.37.

71. **Alactaga Indica**, Gray.

A. Indica, Gray, Ann. Mag. Nat. Hist. ser. 1, vol. x, (1842), p. 262.
A. Bactriana, Blyth, Cat. Mam. Mus. As. Soc. p. 110.

1. Katrú, Sarján, between Karmán and Shiráz .. 5000

This species has been confounded with *A. acontion*, Pall. It is distinguished by its smaller body, longer tail, longer ears, and different colour.

The only specimen obtained agrees well with the types in the British Museum. It was found drowned in a Kanát or irrigation channel.

Hitherto, this jerboa was only known from Afghánistán. As it is not an Indian animal, but inhabits a different zoological province, Blyth changed the name given by Gray to *Bactriana*. Unfortunately this name appears scarcely less objectionable than Gray's, for hitherto the species has not been found in Bactria proper, comprising the modern Bálkh and the adjoining regions north of the Hindú Kúsh. Rather than propose a new name, I retain Dr. Gray's, though I quite agree with Mr. Blyth in considering it inapplicable.

Colour above fawn, the hairs with black tips, and ashy grey at the base, lower parts white. Upper part of thighs white outside, a black spot behind and inside the thigh just below the white, remainder of the outside and lower part of the inside of the thighs brown; a white line running down the front, and extending over the upper portion of the tarsi and feet, proximal portion of tarsus brown at the sides. Lower part of tarsus naked, some dark hair on the soles just behind the three middle toes, which are covered with white hair above and below, and terminate below the claws in compressed pads, ending in a vertical ridge, which is transversely divided by deep grooves, two in number on the second and fourth toes, three on the third. The ends of the first and fifth toes are 0.8 inch distant from the end of the middle toe, which is longest, the second and fourth toes are 0.15 shorter. Tail brown, with a white and black tip. Ears thinly clad with short brown hair outside and on the terminal half inside; near the anterior margin outside the hair is thicker. Head brown above, whitish above and below the eyes, with some black hairs around the eyelids. Whiskers black, the tips of the longest white or pale. The following dimensions were taken on the animal, a male, when fresh:—

	In.
Length from nose to root of tail	3.6
Length from tail to end of vertebræ	7
Length of hairs at end of tail	0.6
Total	11.2
Height of ear measured from orifice	1.6
Height of ear measured outside from top of head between the ears	1.7
Breadth of ear	0.9
Length of fore limb	1.45
Length of fore foot (palma)	0.45
Length of hind limb	4.15
Length of hind foot (planta)	2.2
Diameter of eye	0.33

The incisors are white, and not grooved.

[With the exception of the jerboa with long ears we found drowned at Katrú, I have never seen one on the plateau, though another species is common about the coast of the Persian Gulf.—O. St. J.]

72. **A. decumana?** (Licht.)—De F.

Mus jaculus, Pall. Nov. Spec. Glir. p. 275, Pl. XX, nec Linn.
Dipus jaculus, Gmel. Syst. Nat. i, p. 157, partim.—Pall. Zoogr. Ross. As. i, p. 181.—Brandt, Bull. Ac. Sc. St. Pet. ii, p. 220.—De F. Viag. in Persia, p. 343.

1. ? Near Bushire.

Brandt, l. c., considers *Scirtetes* (= *Alactaga*) *decumanus*, Licht., *vexillarius*, Evers., and *spiculum*, Licht., varieties of *Dipus jaculus* of Pallas, despite their variation in size, length of ears, and extent of black tuft at the end of the tail. These are, however, well marked varieties, and the only specimen obtained in Persia, which was procured by a collector who accompanied Major St. John in 1871, agrees best with *A. vexillaria*.

The name *Alactaga* (*Scirtetes* or *Dipus*) *jacula* cannot be employed for this species, since it is derived from *Mus jaculus*, Linn. apud Pallas. But *M. jaculus* of Linnæus is described as having the hind feet tridactylous, and as being found in Egypt, and is manifestly *Dipus Ægyptius*, Hasselq., to which the name *D. jaculus*, L. should be applied [1].

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[1] This, I find, has been noticed by Milne Edwards, in his 'Recherches sur les Mammifères.'

It is possible that Linnæus may have included the Central Asiatic form, for amongst the localities he gives Calmukia (probably Tartary), but the description shows clearly to which animal he refers.

The name next in priority to Pallas's according to Wagner, *Cuniculus saliens*, S. G. Gmel., was never given. In the Reise durch Russland, i, p. 26, a description is cited from J. G. Gmelin, commencing *Cuniculus pumilis saliens.*

The name next in order, on the same authority, is *Mus saliens*, Haym, Thes. Brit. ii, p. 149. The only work I can find in the British Museum, corresponding with this description, is the 'Thesaurus Britannicus' of Haym, the second edition of which was published 1763–65, before the date of the twelfth edition of the 'Systema Naturæ.'

The next name is *Dipus Alagtaga* of Ollivier, which cannot be used, because the specific name has been rendered generic; and then comes Lichtenstein's name *decumanus*, given in the Abhandl. Berl. Akad. 1828, p. 154. If *Scirtetes decumanus*, Licht., and the other forms distinguished by Lichtenstein and Eversman be kept distinct, the original species of Pallas, so far as I can see, is without a name.

The specimen obtained is sandy brown above, light rufous fawn on the sides, white below, the colours passing somewhat into each other, except on the sides of the abdomen and thighs, where they are distinct. The fur is very soft, on the upper part it is slaty at the base, fawn coloured near the ends, black at the tip. There is the usual white patch at the side of the thigh, but the outside of the thighs as far as the tarsal joint is light rufous brown, tarsi and hind feet white above, brownish at the sides, naked in the middle below. There are some rather longer white hairs at the sides of the toes and beneath them, and dark hair on the lateral portions of the sole just behind the toes. Ears naked inside, and nearly so outside, except near the anterior margin, where they are covered with short brown hair. Sides of the head below the eye, a small space above the eye, and another at the base of the ear, whitish; a few black hairs round the eye. Whiskers black, the extremities of the longer ones white. Tail brown, with the usual black and white tip. The measurements are taken from a stuffed skin: length about seven inches, tail (vertebræ not preserved) about the same, ears 1.7 long, 0.7 broad, tarsus and hind foot 2.6, longest whisker 3.5.

This species inhabits the plains near Bushire, I believe; but as the skin is not labelled, there may be some mistake as to its locality.

Major St. John, however, feels sure that it was procured there. I saw a specimen, apparently of the same species, at Genoa labelled Persia. De Filippi states that *D. jaculus* is common everywhere in the steppes, and he notices that the newly-born young have the hind legs no longer than the fore.

FAMILY HYSTRICIDÆ.

73. Hystrix cristata, L.

1. Jálk, Balúchistán .. .. — — 3000

The only specimen obtained appears to be undistinguishable from the European species; the skull is larger and the nasal bones longer than in *H. leucura*. The total length of the skull is 5.7 in., whilst that of an old and very large specimen of *H. leucura* is only 5.25, Blyth. J. A. S. B. xx, p. 170, breadth across zygomatic arches 3.25, length of suture between nasal bones 2.75.

The following were the dimensions taken upon the fresh carcase:—

	Ft.	In
Length from nose to anus	2	5
Length of tail	0	3
Length of spines at end of tail	0	5
Total	3	1
Height at shoulder	0	11
Height of ear from orifice	0	1.75
Breadth of ear	0	1.1
Length of fore foot	0	2.5
Length of hind foot	0	3.5

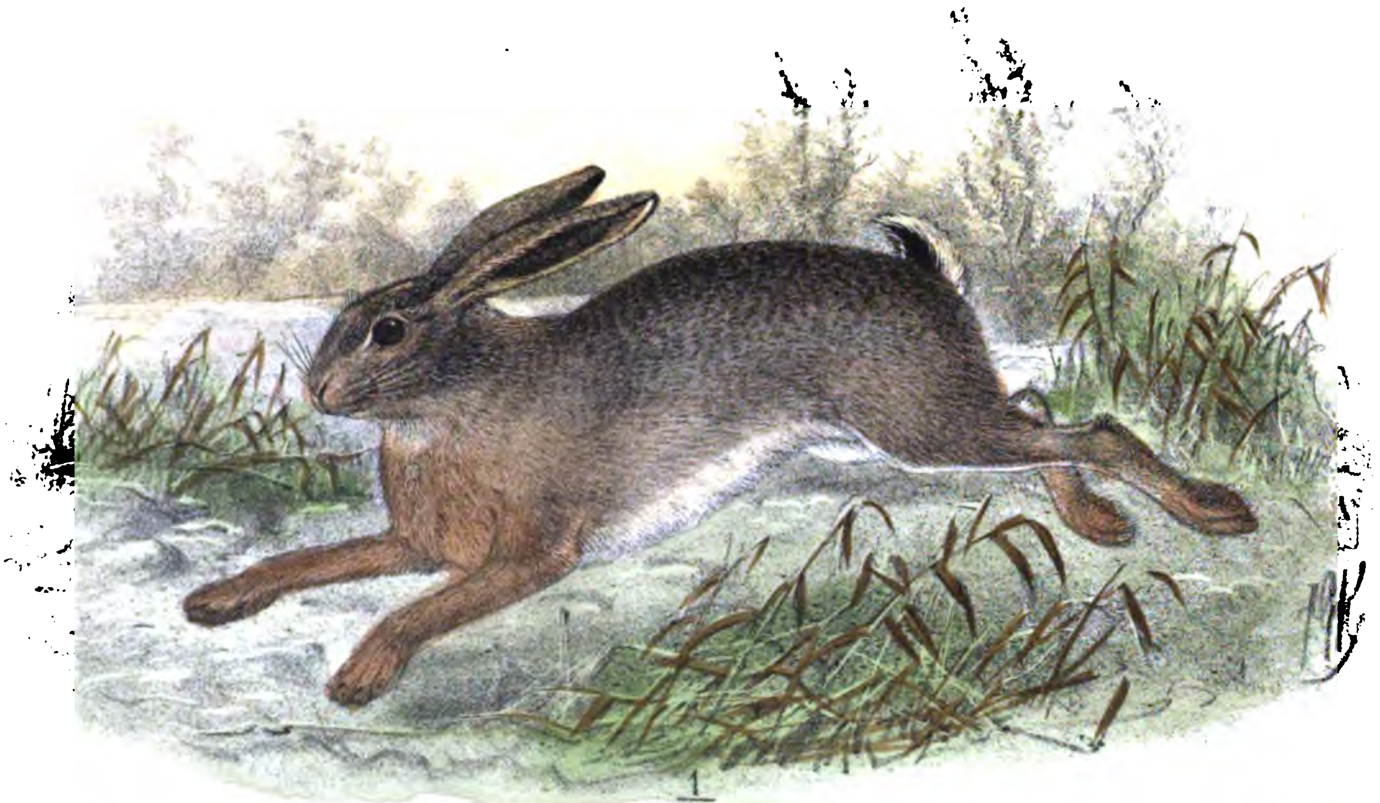
Although *H. leucura*, Sykes, is quoted from Persia by several writers, I greatly doubt if it be found on the plateau; it may very possibly inhabit lower Balúchistán however, and Blyth gives Afghánistán as its habitat. It so closely resembles *H. cristata* that the two may be easily mistaken for each other, indeed it is a question as to whether they are really distinct. The common porcupine is found throughout Persia, and especially in the Caspian provinces.

FAMILY LEPORIDÆ.

74. Lepus craspedotis, sp. nov. Pl. VIII.

1. Píshín, Balúchistán 500

L. *supra fuscus, ex nigro cum isabellino vermiculatim mixto, pilis mollissimis basin versus pallide cinereis, juxta apicem nigris, isabellino-*



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LEPUS GRASPEDOTIS

terminatis; subtus albus; nuchá, collo posteriore, pectoreque fusco-rufescentibus; auribus magnis, extus brunneis, postice apicem versus nigris, intus fere nudis, margine posteriore isabelliná, anteriore pilis longioribus albidis indutá, apicem versus nigrá; caudá supra nigrá, ad latera subtusque albá. Long. (feminæ adultæ nuper occisæ) corporis cum capite 15, *caudæ* 3.5, *auris* 6 *poll. Angl.*

Habitat in Balúchistán.

Colour brown above, white below; the fur of the back is very pale French grey at the base, then black, and the tip is pale brown, almost isabelline. The black rings are wanting on the nape, hind neck, and breast, which, like the fore legs and hinder part of the tarsi, are pale rufous brown. Ears externally mouse brown, blackish brown on the posterior portion near the tip, the anterior edges white with rather longer hairs, except near the tip, where the hair is short and black, the posterior margins inside pale isabelline, the pale edge becoming broader near the tip. Tail black above, white on the sides and below. Whiskers black near their base, white, except in the shorter ones, throughout the greater part of their length; a pale line from the nose including the eye continued back nearly to the ear.

This species is near to *L. Mediterraneus* in appearance, but it is less rufous and has much larger ears. It is still closer to some specimens brought by Canon Tristram from Palestine, distinguished by Dr. Gray, upon the characters of the skull alone, Ann. and Mag. Nat. Hist. 1867, ser. 3, vol. xx, p. 222, as *Eulagos Judeæ*[1]. This form is rather larger, the tarsus in a full grown specimen measuring 5.1 in., it is much more rufous, and the dorsal fur is creamy white at the base, instead of being pale cinereous.

The following are the dimensions of *L. craspedotis*, taken from the fresh specimen, a female:—

	In.
Length of head and body	15
Length of tail	3.5
Length of hairs at end of tail	1
Total	19.5
Length of ear measured outside from top of head	6
Breadth of ear laid flat	3.25
Tarsus and hind foot	4.25
Carpus and fore foot	2.5

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[1] It is a question whether a name given with so imperfect a description should be accepted. The fur of *E. Judeæ* is rather rufous brown above, creamy white at the base, dark brown near the end, with isabelline tips, white below. The ears are precisely the same as in *L. craspedotis*.

In the dried specimen the ears measure nearly five inches from the orifice.

This was the only hare I shot. I was singularly unfortunate with the genus in Persia.

75. *Lepus Caspius ? H. and E.—De F.

L. timidus, L., Mén. Cat. Rais. p. 23.—Pall. Zoogr. Ros. As. i, p. 149.—De F. Viag. in Persia, p. 343 (nec Linn.).
Khar-gúsh (Ass's-ears), Persian.

Unfortunately I did not obtain a single specimen of hare on the Persian highlands, and I have consequently been unable to ascertain what species are found there. *L. Europæus*, Pall. (*L. timidus* [1], auct. nec L.) is given by Pallas and De Filippi as inhabiting Northern Persia; but the latter says it is a smaller and paler variety than the common European hare, and its identity is very doubtful. Ménétries also states that it is found in Lankorán.

L. Caspicus, Hemp. and Ehr. Symb. Phys. fol. y. is said to be the *L. timidus*, Pall. from Astrakan.

A specimen labelled *L. Caspius*, from the Caucasus, in the British Museum, resembles *L. timidus* in general structure and appearance. It has comparatively rather small ears and long limbs. The fur above is creamy white at the base, black for some distance near the end, tips pale brown; nape, breast, and fore legs pale rufous with a pinkish tinge. Ears outside in front brown, *behind pure white* except for an inch near the tip, where they are black, inside nearly naked except on the hinder part near the margin, where they are well clad with brown hair, outside this is a narrow whitish edge along the margin. Length of tarsus 5.5 inches, ear 4. This may be the species found in North-western Persia.

The peculiar colouration of the ears agrees with Hemprich and Ehrenberg's description of those parts in *L. Syriacus;* nothing is said of the ears being white behind in *L. Caspicus.*

[Abbott (Journal Geographical Society, vol. xxv) speaks of a very small hare he found south-east of Shiráz and in parts of Western Persia. Can he mean the long-eared *Alactaga,* which inhabits the places he mentions?

Hares are generally diffused throughout Persia, but very irregularly. The cultivated country about Tehrán and Isfahán would swarm with them, were they not kept down by coursing at all seasons. About Shiráz, apparently a more favourable locality, the crops being more varied, and therefore cover more constant, there are none, though they are not rare in the hilly desert country to the north, and they swarm in the jungly bed of the Kárá-agatch river, twenty miles west of the town. Possibly the hare of the south, which seems to avoid cultivation, may be distinct from that of the north, whose habits are more like those of our own.—O. St. J.]

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[1] The true *L. timidus* of Linnæus is *L. variabilis*, Pall.

76. Lagomys rufescens, Gray, Pl. VI, fig. 2.

Ann. and Mag. Nat. Hist. 1842, ser. 1, vol. x, p. 266.

1–20. Kohrúd, north of Isfáhán .. 8000–9000

This agrees well with the typical specimen in the British Museum from Afghánistán.

The general colour of the back is light rufous brown, the rufous tinge being much more marked in some specimens than in others. Round the back of the neck, extending from the nape to the shoulders, is a broad whitish demicollar, behind this is a rufous band of about the same breadth, sometimes ending behind in a distinct sharp margin where it meets the brown of the back, but more often passing gradually into the latter colour, and terminating at each side in a well marked rufous patch in front of the shoulder. Upper surface of the head rufous, lower part of the cheeks the same but paler, before the eye and between the eye and the ear pale brown, lower parts pale isabelline. Underfur blackish.

The fur is soft, but rather short. The feet are thickly covered with hair beneath, with the exception of a small pad near the end of each toe. The ears are round and are rather thinly clad outside, and for some distance from the margin inside, with short light brown hair. The whiskers are black.

The following are the dimensions, in inches, of four fresh specimens taken at Kohrúd:—

	♂	♂	♀	♀
Length from nose to rump	7·5	7	6.5	6.5
Length from shoulder to rump	5·25	4·75	4·5	4·25
Length of head	2	1.9	1.82	1.82
Height of ear from orifice	0.78	0.8	0.72	0.8
Breadth of ear laid flat	0·78	0.77	0.7	0.78
Length of fore foot and claws	0.95	0.78	0.8	0.83
Length of hind foot and claws	1.32	1.16	1.2	1.25
Longest whisker	2.25	2.2	1.87	2.1

The skull of an adult male is 1.9 inches long and 0.92 broad across the zygomatic arches, the corresponding measurements in the skull of a female are 1.75 and 0.88. The intestines of an adult female measured 80 inches, being much more than they are even in *L. Roylej* (J. A. S. B. xli, pt. 2, p. 36).

This *Lagomys* abounds on the higher parts of the mountains near Kohrúd, at elevations exceeding 8000 feet, living amongst stones and in holes beneath them. At the time of my visit to the place in 1872, I was told that they were less numerous than usual, numbers having perished in the great cold of the preceding winter. I have never heard of any *Lagomys* elsewhere in Persia.

SIRENIA.

I cannot learn with any certainty that the dugong, *Halicore dugong*, Exl. (v. *cetacea*, Illiger) has been met with on the Persian coast. It is said to occur there by Murray (Geog. Dist. Mam. p. 202), but I do not know on what authority, and consequently I do not include its name in the list. It has not, so far as I am aware, been observed on the west coast of India farther north than Canara, and I cannot find it recorded from any part of Arabia east of Aden. The dugong of the Red Sea was classed as distinct by Rüppell, but most naturalists appear to doubt its separation, and the Indian species is said to inhabit the east coast of Africa.

UNGULATA.

FAMILY EQUIDÆ.

77. *Equus hemionus, Pall.

E. onager, Pall.
Gúr-khar, Persian.

In using the name *Equus hemionus* for the Persian wild ass, I adopt the view, held by several of the naturalists who have written on wild asses[1], that there is but one species throughout Asia, divided into several different races, which, however, show so much individual variation, that it is not possible to distinguish them one from another. Thus the two races stated to differ most widely from each other are the Kyang of Tibet (*E. equioides*, Hodgs.), believed to be identical with the Chigetai of Tartary (*E. hemionus*, Pall.), and the Gúr-khar of North-western India (*E. Indicus*, Sclat.), yet the figure of an animal, proved to be a Tibetan Kyang, was mistaken by Blyth, who probably knew both animals as well as anyone, for a Gúr-khar (J. A. S. B. 1859, xxviii, p. 239, xxix, p. 136).

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[1] For a complete summary of the facts known respecting the different races of wild asses, see George, Ann. Sci. Nat. 1869, xii, pp. 1-48.

There are said to be at least four different races, three of which have received names, found in different parts of Persia, even if the Kyang form, the true *E. hemionus* of Pallas, be not met with in North-eastern Khorassán. These races are :—

1. The wild ass of Balúchistán, which I have every reason to believe is identical with that of Kachh, and of the deserts of the Indus valley (*E. Indicus*, Sclater).

2. The wild ass of the province of Fárs, described and figured by Ker Porter, (Travels in Georgia, Persia, etc., p. 459, Pl. XI). It is said to want both the dorsal and humeral stripes.

3. The animal found in Northern Persia, in the deserts near Tehrán. This is the type of the *Onager* of Pallas (*Equus onager*, auct.), the original specimens described by the great Russian naturalist having been procured from near Kazvín.

4. The wild ass of Mesopotamia (*E. hemippus*, Geoffroy St. Hilaire).

Wild asses are locally distributed in Balúchistán, and I only heard of their being abundant near Bampúr. None are said to be found in the deserts north of Jálk and Kalagán, though Ferrier speaks of them as common farther north in Sístán. In Persia they appear similarly to be common in some places, generally on the borders of desert plains, rare or unknown elsewhere; but they occur scattered over all the more level parts of the country, except in the North-western and Caspian provinces. I saw none during my journey, though I often came across their tracks.

[It is impossible to say, with any degree of certainty, whether there are one or two wild asses in the Persian highlands; or, if there are two, whether they have distinct habitats. Persians say there are three, which they distinguish as *Gúr-khar*, the wild ass, *Gúr-asp*, the wild horse, and *Gúr-kátir*, the wild mule, the last being presumably a hybrid between the two first. All of twenty or more specimens that I have seen from Western Persia were undoubtedly *E. onager*, and it would look therefore as if the distinctions made by Persians were dependent on size alone; but I have never seen skins from Khorassán, and it may be that *E. hemionus* extends from Tibet into North-eastern Persia.

The Persian wild ass is not, I believe, found west of the main road from Tehrán to Shiráz, except possibly in that arm of the salt desert which extends north of Kom (Kúm or Koom) towards Saveh. It is most plentiful in the vicinity of the patches of salt desert, '*Kafah*' or '*Kavír*,' which are so marked a characteristic of Eastern Persia. In the summer a herd occasionally wanders into the loftier desert valleys. I have several times seen them whilst travelling post along the plain that stretches from Khán-i-Khora, a short distance north of Dehbíd, in Fárs, to the Kulah Kázi or Urchín Hills, near Isfahán, a distance of nearly 150 miles, at an elevation of 5500 to 7000 feet above the sea. Persians say that they cannot be caught by a single horseman when approached in the open; but if the sportsman can manage to conceal himself and his horse in the vicinity of a spring, and wait till the wild asses have quenched their thirst, they can readily be come up with when full of water, by a short spurt on a fast horse. At other times they are caught by relays of horsemen and greyhounds. The flesh is said in books on Persia to be prized above all other venison; but Persians have told me that it should only be eaten under absolute necessity, being equally disagreeable to the conscience of a good Mussulman, and to the palate of a gourmand.—O. St. J.]

Family SUIDÆ.

78. *Sus scrofa, L.—De F.

Sus aper, L., De F. Viag. in Persia, p. 344.

Gúráz or *Kúk*, Persian.

By all accounts, the wild hog of Persia and Mesopotamia is the same as that of Europe. I had no opportunity, however, of examining specimens.

The wild hog of Balúchistán may perhaps be *S. cristatus*, Wagner, (*S. Indicus*, Gray, nec Pall.), the common wild hog of India, but I saw no specimens. It is probably identical with the wild hog of Sind.

[The wild hog abounds in suitable localities throughout Persia. In the oak forests of Fárs, and the reedy swamps of Khúzistán, it furnishes food for the lion, and in the Caspian provinces for the tiger. Shooting pigs from horseback is a favourite diversion with Persians, and though the city people let the game lie where it falls, the Ilyáts are by no means so particular, and do not always permit the precepts of the Korán to prevent their indulgence in a rasher. Young pigs are often kept in the stables of great men, under the idea that their presence will divert glances of the evil eye.—O. St. J.]

Family BOVIDÆ.

79. **Ovis cycloceros**, Hutton.

Gúch, male, *mísh*, female, Persian.
Gad, male, *garand*, female, Balúchistán.

1	♂. Jálk, Balúchistán	3000
2	♀. Dizak, Balúchistán	4000
3	young. Shiráz, Southern Persia	5000

The last specimen is too young for the species to be determined with any certainty, and I have seen no adult examples from Southern Persia west of Balúchistán, so the sheep occurring near Shiráz may possibly differ from *O. cycloceros*, which inhabits the salt range of the Panjáb, Afghánistán, and the hills of Sind. *O. cycloceros* is found in the warmest regions inhabited by any wild sheep. We heard of its occurrence, and saw its tracks, close to the sea level on some low hills three marches west of Gwádar in Balúchistán, a country with an excessive summer temperature, and it is found on hills of no great height in Sind, where the climate is still hotter. It is usually met with in small herds, which keep to the slopes of hills and small valleys between the ranges.

The specimen obtained at Jálk measured about 4 feet from nose to rump along the curves of the head and back, and 2 ft. 8 in. high at the shoulder. Each horn measured 14 inches round the curve. The horns are rather more closely wound, that is, the diameter of the curve described by them is less than in Panjáb heads with which I have compared them, and the anterior ridges of the horns are more prominent, but these differences are not great. The horns closely resemble those of *O. Vignei* from Ladák.

80. **O. Gmelini**, Blyth.—De F.

Das orientalische Schaf, S. G. Gmelin, Reise, iii, p. 486, Pl. LV.
Ægoceros musimon, Pall. Zoogr. Ros. As. i, p. 230, partim, nec Schreb.

Das Persiche Mouflon, Wagner, Schreb. Säugth. v, Pl. LI, p. 1385.

Ovis Gmelini, Blyth, P. Z. S. 1840, pp. 69, 78; Ann. and Mag. Nat. Hist. ser. i, vol. vii, p. 250, Pl. V. f. 8.—Frazer, Zool. Typ. Pl. XXI.

O. orientalis, Gmel. apud Keys. und Blas. Wirbelth. Eur. pp. v, 29. (1840).—Wagner, Säugth. iv, p. 507.—Gray, Cat. Mam. B. M. Ung. Furcip. p. 173.—Blasius, Säugth. Deutschl. p. 472, f. 249.

? *O. anatolica*, Val. Rev. Mag. Zool. 1856, p. 346; Comptes Rend. 1856, xliii, p. 65.

1 ♂. Elburz mountains, north of Tehrán .. 12000

This species is found in the Elburz, and also in the mountains of Armenia. The specimen obtained in the former locality by Major St. John is the head of a fine ram, and agrees excellently with one in the British Museum, sent from Erzeroum by Messrs. Dickson and Ross.

No such name as *O. orientalis* was given to this sheep by S. G. Gmelin; he simply called it in German the oriental sheep, and apparently considered it the same as the *Argali* of J. G. Gmelin (*O. ammon*, L.) The name *O. orientalis* appears to have been first given as from Gmelin by Keyserling and Blasius in the 'Wirbelthiere Europa's.' The date on the title page of that work is 1840, and in the same year, Mr. Blyth published the name *O. Gmelini*, which should, I think, be retained for the species, since Keyserling and Blasius's title is erroneously quoted as Gmelin's.

[I was always under the impression that the only wild sheep of Persia was *O. cycloceros*, till Mr. Blanford compared a head which I got on the Elburz, close to Tehrán, with a specimen we obtained in Balúchistán. It now appears that the sheep of Northern Persia is *O. Gmelini*. Where the two species meet it is impossible to say, as our only two specimens are from places 1500 miles apart. I believe myself that it will be found that *O. Gmelini* is confined to the Elburz, and that *O. cycloceros* extends from Balúchistán to Mesopotamia. The wild sheep of the south is found, so far as I have observed, at much lower elevations than that of the north. In Fárs I have noticed that *O. cycloceros* is generally found in the lower hills, whilst the ibex rarely leaves the higher summits, and about Isfahán it is not uncommon to find wild sheep grazing in the plain near the hills, whereas in the Elburz they seem as fond of lofty elevations as *Capra ægagrus*. The specimen before mentioned I shot at about 12000 feet. One species or the other is very plentiful everywhere.—O. St. J.]

81. Capra ægagrus, Pall.—De F.

Antilope gazella, Gmel. Syst. Nat. i, p. 190.
? *Hircus gazella*, Gray, Cat. Rum. Mam. 1872, p. 53, nec *Capra gazella*, L.
Pásang, the male, *Boz*, the female, generally *Boz-Pásang*, Persian.

1 young ♂. Hills between Magas and Aptar, E. of Bampúr 4000
2 ♂, (horns). Near Shiráz.
3, 4 ♂, (horns). Isfahán.

So far as I have been able to ascertain by comparing the horns, I believe that the ibex, or wild goat of all Persia, is identical with that of Asia Minor on the one hand, and of Sind on the other. It inhabits a great range of climate, for I have seen it not 1000 feet above the sea, close to the coast, in Balúchistán, and it is found on the peaks of the Elburz, ten degrees farther north, at a great elevation. It would be very desirable to compare perfect specimens from all the localities.

It is just a question whether this is not *Capra bezoartica*, L., Syst. Nat. p. 96, but that is described '*cornibus teretibus arcuatis totis annulatis, gula barbata*,' and appears founded on a confusion between *Capra ægagrus* and *Gazella subgutturosa*. The animal, however, was admirably described by Pallas, Schreber, and others of the older writers, and it is the 'Caucasan' of Pennant. A very full account of its habits is given by Kotschy, Verh. Zool. Bot. Ver. Wien. iv, 1854, p. 201.

I believe that it is well known that the true bezoar[1], a calcareous concretion, to which extraordinary virtues were formerly attributed as an antidote to poison, is obtained from the stomach of this animal. The governor of Karmán gave specimens to Major St. John and myself when we were at that city, and assured us that they were only to be obtained from the ibex inhabiting the hills between Karmán and Shiráz. They still bear a high value in Persia, being employed not merely as an antidote to poison, but as a universal remedy for all diseases. They are also worn, enclosed in cases of filagree gold, by women. The specimen I possess is 0.75 in. long, and 0.65 broad, egg shaped, of a dark olive colour, with a highly polished surface. The size, shape, and colour of these concretions are, however, variable.

Capra Caucasica, Güld., and the chamois, *Rupicapra tragus*, are said to be found in the Caucasus, but neither of them has hitherto been observed in the Persian mountains.

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[1] The word 'bezoar' is Persian, the true name being Pá-zahr, a corruption of Fá-zahr, 'useful (for) poison.' Several authors suppose it to be derived from Pásang, but this is an error.—(O. St. J.)

[illegible] all elevations, but always near the top. [illegible] summit of the Shamirán mountain, near Tehrán, [illegible] sea, and on the hills near Bushire, not more than [illegible] the constant persecution to which it is subjected, it [illegible] On the Kúh-i-barf, a not very lofty or extensive [illegible] shot over, near Shiráz, I once counted over a hundred [illegible], which had been driven together by two days' consecutive [illegible] half-a-dozen shikárís.

The Persians have a curious habit of naming the ibex and the wild sheep, which has led many travellers to record that there are two species of the former. The male of the wild goat they call 'Pá-sang,' the rock-footed, and the female 'Boz,' the latter term being also applied to both sexes of the common domestic goat. Similarly, the wild ram is called 'Gúch,' and the wild ewe 'Mísh,' as is also the female of the domestic sheep. But when speaking of either animal generally, they talk of 'Boz-pásang,' 'Gúch-mísh,' much as our ancestors, in ballad poetry at least, spoke of hart and hind. Hence more than one traveller, probably a better linguist than a sportsman or naturalist, has recorded the occurrence of a wild goat and wild ibex as separate species.

The ibex is marvellously shy and wary. In my earlier residence in Persia I spent many a weary day after them, but never managed to bag a buck. Even native sportsmen, though admirable shots, and thoroughly familiar with every rock and cranny of the hills, rarely get one by fair stalking, most of those killed being obtained by building a wall of loose stones near water, and shooting the goats when drinking. The males drink in the morning and evening only, but the females, in the hot weather at least, drink also at mid-day. While putting up the telegraph about sixty miles north of Shiráz in July, [illegible], I came suddenly upon a herd of twenty or more, does and kids, drinking by the road side, a couple of hundred yards from the foot of the hills. Except when alarmed, bucks and does seem to keep apart. Out of the rutting season the flesh is very good, incomparably the best venison in Persia; dark coloured, and more like beef than mutton in flavour.

The markhor, C. *megaceros*, is said by Dr. Bellew to occur in Persian [illegible], but he does not seem to have seen a head. He may have [illegible] by the double appellation of the ibex, mentioned [illegible] [W. St. J.]

82. Gazella subgutturosa, Güldenst.—De F.

Ahú, S. G. Gmel. Reise d. Russl. iii, p. 496, Pl. LVI.
Ahú, Persian.

1 ♂, 2 ♀. Near Isfahán 5000

I gave some details as to the distribution of this and the other species of gazelle found in Persia in the Proceedings of the Zoological Society for 1873, pp. 313–319.

G. subgutturosa is the gazelle of the Persian highlands, and found in almost all valleys and plains from about 3000 to about 7000 feet above the sea, ranging higher in winter and lower in summer, but keeping generally within the limits mentioned. It is unknown in the plains of Mesopotamia, and in the lower ground along the Persian Gulf and the Arabian Sea. To the north it extends to the Caucasus, but not beyond, being found on the shores of the Caspian near Bákú. It extends into the countries east of the Caspian, and is said to be found as far as Bokhara; it is probably the gazelle of Meshed and Herat, and is common in parts of Afghánistán; specimens from Kándahár exist in the Museum at Calcutta, so that its range extends almost to the frontiers of India. In the central deserts of Persia it may be more or less replaced by *G. fuscifrons*.

[This is the common gazelle of Persia, and is found everywhere away from the forests of the Caspian and the shores of the Gulf; in which last locality it is replaced by another species, probably *G. Bennetti*. Like the wild ass, it especially affects the neighbourhood of the salt deserts. It appears to retire generally to the valleys at the base of hills to breed, and is most commonly seen in small parties of three to half-a-dozen. I do not remember ever having seen twenty together. The fleetest greyhounds cannot come up with the gazelle when it gets a fair start, but when suddenly roused from a hollow, or when the ground is heavy after rain, good dogs will often pull down males. The does are more difficult to catch.—O. St. J.]

83. G. Bennetti, Sykes.

A'st, Balúch.

1 ♂. Bampúr, Balúchistán 1700

In the paper already mentioned, P. Z. S. 1873, p. 315, I have entered at some length into the range of this animal. It extends from India throughout the low country of Balúchistán near the coast, and it is probably the species which is found, as I am assured by Major St. John, near Bushire, so that its range would extend to the head of the Persian Gulf. All the gazelles seen by me in Balúchistán, below 3000 feet, appear to belong to this species, easily recognized by its colour, even at a distance, as distinct from *G. subgutturosa*. The specimen obtained at Bampúr agrees in colour and dimensions with Indian specimens, and the horns only differ in being a little more curved backwards, and slightly more lyrate when viewed from the front. The difference is very trifling.

84. * ? G. dorcas, L.

This, *teste* Schmarda, is the gazelle of Mesopotamia. It is probable that either this species, *G. Arabica*, or an allied race, is found there. On the known distribution of *G. dorcas* and other species of gazelle, see Sir V. Brooke, P. Z. S. 1873, p. 535.

85. G. fuscifrons, W. Bl.

P. Z. S. 1873, p. 317 (with woodcuts of head).

1 ♀. Jálk, on southern edge of Sístán desert .. 3000

The following description is copied from that given in the Proceedings of the Zoological Society. The female procured at Jálk is the only specimen which I have been able to examine. The animal belongs to the same section as *G. dorcas* and *G. Bennetti*, and not to that of *G. subgutturosa*, in which the females are hornless.

Forehead black, mixed with brown, the black being purest at the base of the horns and in two points descending about 1½ inch from each horn towards the nose. A black patch about 2 inches long on the top of the nose (? separated from the forehead-patch and) not extending to the nostrils[1]. A mixed brown and black line from the anterior angle of the eye to the side of the upper lip. All round the eye (with the exception of the anterior angle) and a broad band from above the eye to the muzzle, including the nostrils, isabelline. A few long black hairs above the eye. Remainder of the face fawn-coloured. Ears isabelline-fawn exteriorly, dirty-whitish within, the upper half with a dark brown edge outside.

The general colour of the back is ochraceous, rather yellower than in the allied species. The tips of the hair are of this colour, which may be specified as yellowish fawn, the whole basal portion being pale fawn-colour without any yellow. The centre of the back appears scarcely darker than the sides; the posterior edge of the dorsal colour on the rump is a little darker, but not much; and the margin of the fawn-colour is well defined everywhere against the white of the under parts. Tail and knee-brushes black; hair at the backs of the feet from the fetlock (metacarpal and metatarsal) joints to the hoof, and between the division of the toes in front, dark brown.

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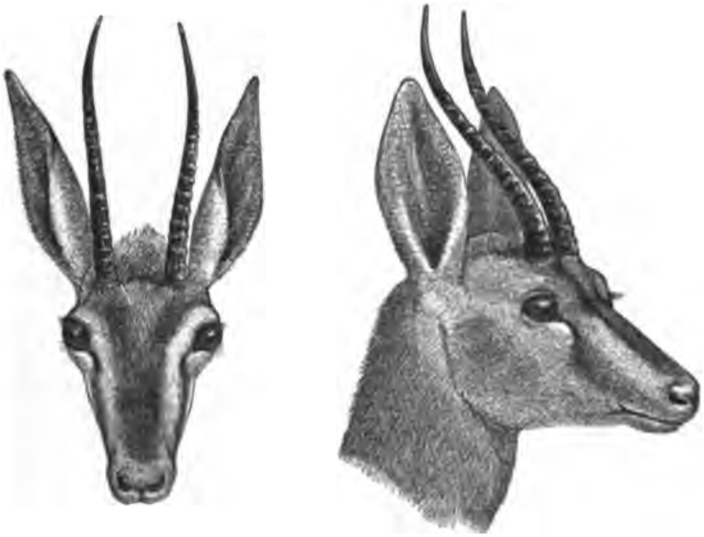
[1] In the only specimen obtained, the hair on the face between the forehead and nose is much worn off; and perhaps in other specimens the dark forehead and nose-patches may be united or nearly so.

The hair is both thicker and longer in the specimen before me than in skins of *G. Bennetti* and *G. subgutturosa*. This may partly be due to the date (March 15) when the specimen described was shot, but not entirely, I think.



Head of *Gazella fuscifrons* ♀[1].

The horns near the base are nearly parallel, and they only diverge very slightly throughout, curving a little inwards towards the tips. They gently bend backwards near the base, and then forwards, the anterior curve being steady, not sudden. Except at the extreme tip, they are distinctly though very bluntly ringed throughout. It may fairly be assumed that the curve in the male is similar, but more pronounced.

[1] For the use of this woodcut I am indebted to the Zoological Society.

The following dimensions were taken on the body before skinning:—

	Ft.	In.
Length from nose to between ears	0	7
Length between ears to top of shoulder (wither)	1	0
Length from top of shoulder to insertion of tail	1	9
Length of tail	0	6
Length of hairs at end of tail	0	2
Total length from tip of nose to end of tail	4	0
Length of ear measured from the orifice	0	5.6
Breadth of ear laid flat	0	2.5
Length of body from front of shoulder to rump	2	0
Height at shoulder	1	11
Length of fore leg	1	4.5
Length from knee to fetlock (metacarpal joint)	0	6.5
Length from fetlock to end of toe	0	3.5
Length of hind leg	1	11
Length from hock to fetlock (metatarsal joint)	0	9.25
Length from fetlock to toe	0	3.25
Length of horn from base to point, measured in a straight line	0	7.25

This gazelle is distinguished from *G. Bennetti* first by colour. The face in the Indian gazelle is nearly uniform rufescent fawn-colour, the parts which are black or blackish in *G. fuscifrons* being only a little darker than the rest in *G. Bennetti;* the back also in the latter is more rufescent and less yellow, and the fur is less dense. Secondly, by the greater length and more strongly marked annulation of the horns in the female, and by their well-marked curvation forward near the extremities. The horns in the female of *G. Bennetti* are smaller than those of the male to a much more marked extent than in *G. dorcas;* the new species in this respect agrees probably with the African, and not with the Indian type.

From *G. dorcas*, *G. Arabica*, and all allied forms the present species is also distinguished by the curvature of the horns and the colouration, especially of the face, none having such strong dark patches on the forehead and nose.

Of the range of this gazelle nothing is positively known beyond its occurrence in the desert north of Balúchistán. It probably has a wide range in Eastern Persia and may very possibly be the gazelle of Sístán mentioned under the name of deer by Conolly, J. A. S. B. ix, 723. It is not improbable also that it extends through part of Sind and the desert country east of the Indus to Rájpútána, for Dr. Jerdon in his Mammals of India, p. 281, mentions having seen 'one or two heads of gazelles considered distinct from the *chikara* (*G. Bennetti*) called the desert antelope, smaller and with the horns more bent forwards.'

FAMILY CERVIDÆ.

86. * Cervus maral, Ogilby.

Sclater, Tr. Z. S. vii, p. 336, Pl. XXIX.
Marál, Persian.

This, the only true elaphine deer found in Persia, is peculiar to the Caspian provinces. Dr. Sclater considers that the Circassian stag and one found in the Crimea are the same as the Persian *Marál*.

[The *Marál* is very numerous in the forests of the Caspian provinces, but does not occur elsewhere. It is often brought alive to Tehrán, and, before the famine, the Shah's zoological gardens contained seven or eight specimens, which died of starvation or were killed and eaten by the keepers.—O. ST. J.]

87. * C. dama, L.

When I was in Basrah, in 1871, Mr. Robertson, the consul, told me that he had shot two kinds of deer in the country on the Kárún river, in Persian Mesopotamia, one of which he said was spotted. On the discovery of *C. Caspius*, I was strongly inclined to suspect that this must be the spotted deer of Mesopotamia, but a specimen of the latter has since been obtained by Mr. Robertson, and despatched to Dr. Sclater, who considers it a form of *C. dama*. I understand that Sir V. Brooke coincides in this opinion. Dr. Sclater tells me that the skin and horns sent differ somewhat from those of European fallow deer, although not sufficiently to entitle them to specific distinction.

Of the range of the fallow deer in Persia nothing more is known. It is certainly not found on the plateau, but it may exist in the Zagros ranges. Gmelin, in the 'Systema Naturæ,' asserts that it has been found in Northern Persia, but this requires confirmation; it is not improbable that *C. Casvius* has been mistaken for *C. dama*.

88. * C. Caspius, Brooke.

C. Caspicus, P. Z. S. 1874, p. 42.

This is an axine deer, allied to the spotted deer of India. At first a pair of horns only was received from Major Jones, H. M.'s consul at Tabriz, but additional spoils have since arrived, and the habitat has been ascertained to be the Tálish mountains near the south-west corner of the Caspian.

89. * Capreolus capræa, Gray.

The roe is found, according to Pallas, S. G. Gmelin, Ménétries, and Eichwald in Ghílán and Mazandarán, Northern Persia. It is common in the Caucasus, and is probably the second species of deer noticed by Mr. Robertson in Mesopotamia. He observed that this was a small reddish deer and unspotted; so, if not the roe, it is probably an undescribed form.

The red deer, *Cervus elaphus*, is said to be found in the Caucasian and Transcaucasian provinces, and the elk, *Alces machlis*, inhabits the forests of the Caucasus, but neither is known to exist in Persian territory.

[I once saw a small deer, dark red in colour, in the garden where the Shah keeps his zoological collections, but it was very wild, and I could not get near enough to identify it precisely. It was in all probability a roedeer, and must have come from the shores of the Caspian.—O. St. J.]

Domestic ruminants.

The common cattle of the Persian highlands appeared to me to be *Bos taurus*; in Southern Persia[1], however, there is, I think, an admixture of the humped species (*Bos Indicus*), and the latter are the cattle of Balúchistán; according to Ménétries, there is a humped race also in Ghílán. The buffalo, Pers. *gao-mish* (ox-ewe), is rare. I saw a few in Balúchistán; they abound in Mesopotamia, and are common in

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[1] Major St. John informs me that most of the cattle belonging to the Ilyáts of Southern Persia are without humps. Formerly there were, according to the older writers, no humped cattle in Southern Persia, but some twenty years ago numbers of cattle, from Karmán to Shiráz, having died of disease, humped cattle were imported from Sístán to replace them.

Ghîlán and Mazandarán, but I never heard of any on the highlands. Some are kept in Fárs by an Arab Ilyát tribe, hence known as Aráb-gaomíshi, who are, by their own account, comparatively recent immigrants from Mesopotamia.

The common sheep of Persia is the fat-tailed race (*Ovis steatopygus*, Pall.). In Balúchistán and along the coast of the Persian Gulf a long tailed breed is kept, much resembling some Indian sheep. Goats are kept in large numbers everywhere.

[*Camelus dromedarius*, L. is the usual beast of burden in Eastern Persia, as the mule is in the west. Those from Khorassán are the stoutest and strongest, carrying a load of 600 pounds with ease, at the rate of twenty miles a day.

Camelus Bactrianus, L. the two-humped camel, is rare in Persia. A specimen may occasionally be seen during winter in the bazaars of Tehrán among strings of the common camel in caravans from Khorassán. It is said to be commonly used on the east coast of the Caspian.—O. St. J.]

AVES.

The birds of Persia are much better known than the mammals. This is the case in most countries with the fauna of which we are imperfectly acquainted; birds being more numerous, more conspicuous, and more easily collected than mammalia. Still the number of species, 384, known to inhabit Persia is not large, and it is probable that further research will greatly increase the list. Large additions may be especially expected amongst the birds of prey, the smaller passerines inhabiting the forest regions, the waders, and *Anseres*.

At the present stage of enquiry into the affinities of birds to each other, no satisfactory classification has been proposed. It may perhaps never be possible to divide the class Aves into orders (or suborders) as well marked as those which have been adopted for existing Mammalia and Reptilia, but the study of the internal structure of birds has certainly shown that some of the old divisions, and especially those of the wading and swimming birds, are not natural, and require modification.

Several different systems have been proposed, founded upon osteological, intestinal, and myological characters, but all with which I am acquainted depend too much upon one or two selected characters to be adopted. Still there are some points in which all agree. The separation of the gulls and terns from the *Anseres*, and their removal to the neighbourhood of the plovers, appears supported by a mass of evidence which cannot be disputed, and there are equally strong grounds for the separation of the *Herodiones* from the true *Grallæ*. The orders *Pygopodes* and *Steganopodes* also appear fairly natural and well defined. Whether the bustards, cranes, and rails, with some other families, should be placed in a separate order, *Alectorides*, or united partly with the *Grallæ* (*Limicolæ*), and partly with the *Gallinæ*, is quite uncertain, and it appears preferable for the present to leave them in their old position amongst the Schizognathous waders. The position of the *Procellaridæ* appears equally undetermined, and therefore in the present work they are left with the *Gaviæ*, although they appear to be quite as nearly affined to the true *Anseres*.

The dimensions given are in many cases taken from the freshly killed birds: the tail is always measured from the insertion of the central tail feathers to the end of the longest rectrices; the bill, when given as 'from front,' is measured from the commencement of the feathers; 'culmen' is from the rise of the anterior portion of the skull to the tip of the bill.

ORDER ACCIPITRES.

FAMILY VULTURIDÆ.

1. * Vultur monachus, L.

? *V. percnopterus*, Pall. Zoogr. Ros. As. i, p. 375.

I saw several vultures belonging, I believe, to this species in the Elburz, north of Tehrán.

Vultur percnopterus, Pall. Zoogr. Ros. As. i, p. 375, from Northern Persia, may be the young of this species, but the description does not agree well. It is evidently one of the large vultures, and not *Neophron*.

[I once saw a large black vulture, probably *monachus*, feeding on a dead mule in company with several griffon vultures, on the road from Bushire to Shiráz, about twenty miles from the former town. I have never remarked one since.—O. ST. J.]

2. * Gyps fulvus, (Gm.)—De F.

Vultur Persicus, Pall. Zoogr. Ros. As. i, p. 377.
Lásh-khor (Carrion-eater), Persian.

This is, I believe, the common vulture of Persia, which is the original locality given by Gmelin for the species; but owing to the constant habit in which the Persians indulge of firing at large birds, all the vultures and eagles are very wary, and it is most difficult to get near enough to see what they are. Mr. Hume (Scrap Book, vol. i, p. 19, and Stray Feathers, i, p. 148) distinguishes the Indian race as *G. fulvescens*. Southern Persian and Balúchistán birds are doubtless similar to those of India, but it is not yet clear how far the latter are separable from the typical *G. fulvus*, of Northern Persia, and it is quite possible that if the European form be distinguishable from the Asiatic, the former will require a new name, not the latter.

Vultures appeared to me much less common in Persia than they are in India; a circumstance doubtless due to the thinness of the population in the former country, and the paucity of cattle and other domestic animals, on the carcases of which these birds subsist. Wherever a dead camel or mule was seen throughout my journey, there was, however, no want of vultures to devour the body.

I am much puzzled with Pallas's *Vultur Persicus;* it is said to differ from *V. percnopterus* (Pall. nec Linn.) in the bill and feet, the first being nearly cylindrical with a blunt tip, whilst the legs are nude beyond the middle of the thigh, the toes shorter, thick, the outer not joined to the middle by a loose fold, but more narrowly by the whole base (the Latin is rather obscure), and with the claw much smaller than that of the other toes. Now in *G. fulvus* the bill is much more rounded and the tibia less clothed with feathers than in *V. monachus*, which I am inclined to look upon as Pallas's *percnopterus*, but the outer claw is especially small in *V. monachus.*

I think it possible that *G. Bengalensis* may be found in Southern Persia or Balúchistán, but I did not myself notice any of the smaller vultures, and Mr. Hume (Stray Feathers, i, pp. 46, 148) remarks the absence of both *G. Bengalensis* and *G. Indicus* in Sind.

[This, the common vulture of Persia, is rarely seen in the neighbourhood of large towns. It breeds in great numbers in the lofty limestone cliffs bordering the passes of Máyín and Sangbúr, north of Shiráz, migrating in winter to the hills nearer the coast, the difficult defiles of which cause innumerable casualties among beasts of burden, and thus provide an ample supply of food for carrion eating birds. A good instance of the rapidity with which vultures find a carcase came under my observation in 1871. I had shot a large wild ram (*Ovis Gmelini*) on the top of the Shamrán mountain, a spur of the Elburz, near Tehrán, which attains an altitude of about 13000 feet. After gralloching the game and dragging him to the path, I went off to the rest of my party, first looking round and above me to see if any vultures were about. In less than half an hour I returned, to find a dozen or more griffon vultures in possession of my game, of which not a particle of flesh was left but on the neck and head, which, with the exception of the eyes, were uninjured. The skin, except where I had ripped the belly up, was unbroken.—O. St. J.]

3. * **Neophron percnopterus,** (L.)—De F.

Vultur meleagris, Pall. Zoogr. Ros. As. i, p. 377.

Found throughout Persia, increasing in abundance to the south. In Northern Persia generally it is not very common, and it is somewhat locally distributed; thus De Filippi speaks of it as common in the Caucasus and Ghílán, rare south of the Elburz mountains. Ménétries noticed it at Bákú on the Caspian, but not further to the north.

[Widely spread, but nowhere numerous. Birds in the dark phase of plumage are far less common in proportion to the white than I have noticed elsewhere. When I first went to Persia from India, in January 1864, I remarked that I did not see a young bird till I had been constantly travelling for six months, though I never made a march without seeing mature birds. From this and the frequency of Neophrons about Bushire in the late spring and early summer, I fancy that many cross the Gulf to the Arabian coast to breed.—O. St. J.]

Family FALCONIDÆ.

4. * **Gypaëtus barbatus,** (L.)

The Lämmergeyer is found throughout the hilly and mountainous parts of Persia. I did not see it in Balúchistán near the coast, nor below the elevation of about 4000 feet above the sea.

[It is almost impossible to cross any mountain range in Persia without seeing a pair of these splendid birds. Like all the *Raptores* in Persia, they are excessively wary, and I never succeeded in getting a specimen. As far as I can judge I think the Persian bird is as large as the Himalayan.—O. St. J.]

5. * **Falco peregrinus,** Tunstall.—De F.

Bhairí, Persian.

I was not so fortunate as to obtain a single specimen of any of the larger falcons, nor did I often see any. Many kinds are kept by the king of Persia for hawking, but there were none in Tehrán when I was in the capital. I am therefore able to add but little to Major St. John's notes, beyond suggesting what some of the Persian falcons may be, and mentioning those species of which specimens have been obtained by others.

The peregrine was seen in Persia by De Filippi, and there is a specimen in the British Museum, brought by Loftus from Southern Persia.

[Persian falconers set little value on the peregrine. A good many are, however, caught in the mountains near the coast and sold at Bushire and Bandar Abbás to dealers from Arabia.—O. St. J.]

6. * ? **Falco barbarus**, L.

Salvin, Ibis, 1859, p. 184, Pl. VI.—Hume, Stray Feathers, vol. i, p. 19.
Falco communis, Schleg. apud De F. partim.

A specimen at Turin, brought by De Filippi from Persia, and probably one of those which he mentions having killed at Tabriz and Zinján, appears to me to belong to the above species; at least it very closely resembles a bird which I shot in Abyssinia in 1868[1] (Geol. and Zool. Abyss. p. 288), and which Mr. Gurney carefully compared in my presence with a typical specimen from North Africa. The Persian bird is younger, but otherwise the two specimens are closely similar, and both are remarkable for the size of their feet.

The following is a brief description of the Persian specimen. Upper parts dark brown, with rufous margins to the feathers. A demicollar, somewhat broken, of pale rufous on the nape; cheek stripe broad, as in *F. peregrinus*, throat rufescent white; breast and abdomen ferruginous with brown central stripes to the feathers, about ⅛ in. broad on the breast, narrower on the abdomen. Lower tail coverts isabelline with arrow head marks, tail with imperfect pale rufous bars not extending across the webs and about half an inch apart. Wing 12.75 inches, tail 5.8, tarsus 2, hind toe to base of claw 2, outer toe 1.4, inner toe 1.2, hind toe 0.9.

Large as these measurements appear, they quite coincide with those of a female from Barbary in the Norwich Museum. I at first thought the Turin skin a specimen of *F. peregrinator*, Sund. (or of the bird usually so called by naturalists), but that appears larger and darker in all plumages, and the tarsi appear always yellow, whilst those of the Persian bird had apparently been horny or lead grey, as I believe they are in the young of *F. barbarus*. It is not impossible that two falcons are confounded under this name.

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[1] This specimen has, however, since been referred by Mr. Sharpe to the South African *F. minor*, Cat. Birds Brit. Mus. i, p. 383.

7. * ? **F. peregrinator**, Sund.

Sháhín, Persian.

I am informed by Major St. John that the *Sháhín* of Persian falconers is a bird with a dark head, almost black, and a deep ferruginous breast, and that it resembles closely in general appearance the *Sháhín* of India, *F. peregrinator*. Both this species, and its near ally *F. atriceps*, are forest birds; the former is only known to exist in the Indian peninsula, the latter in the Himalayas. No similarly coloured falcon has hitherto, so far as I am aware, been recorded from Western Asia; of course, it may have been overlooked, but I think that the occurrence of any bird closely resembling *F. peregrinator* in Asia Minor needs confirmation. It is by no means improbable that the Persian Sháhín is an undescribed species.

[Persian falconers distinguish three varieties of *Sháhín*, the *Stámboli*, *Karabághi*, and *Fársi*, the first from Western Asia Minor, the second from Circassia, Georgia, and Armenia, the third from Southern Persia. The first has the darkest plumage, the last the lightest. This information I obtained from Timúr Mirza, grand falconer and cousin of the Shah, and one of the keenest sportsmen in Persia. The mews under his charge contained specimens of all three varieties, the *Stámboli* being the most prized.

The *Sháhín* is, however, not so much used in Persia as formerly; indeed I have never seen it out of the royal mews, except when brought to Bushire for sale to the Arabs of the opposite coast. The falcon described by Marco Polo as found in the mountains of Paríz, near Karmán, can be no other than the *Sháhín*. The old traveller says, 'In the mountains of Karmán are found the best falcons in the world. They are inferior in size to the peregrine, red on the breast, under the neck, and between the thighs; their flight is so swift that no bird can escape them.' Yule's Marco Polo, i, p. 86. On the authority of Mr. Keith Abbott, Colonel Yule, in a note to his admirable edition of 'Marco Polo's Travels,' considers the falcon meant to be that now known to Persians as the *Tarlán*. But this is the designation of the female goshawk, a bird to which the foregoing description does not in the least apply, whereas it does admirably to the *Sháhín*.—O. St. J.]

8. * F. Babylonicus, Gurney.

I think it probable that this is one of the falcons called *Sháhín* by the Persians, although the name is evidently applied to other species also. Jerdon (Hume's Scrap Book, i, p. 84, and Ibis, 1871, p. 240) shows that *F. Babylonicus* is the *Sháhín* of the Panjáb. As this bird has been recorded from both Mesopotamia and India its occurrence in Southern Persia may be considered certain.

[A large falcon, probably this or *F. lanarius*, is not uncommon in Central Persia, affecting the neighbourhood of cultivated places surrounded by desert, and generally to be seen perching on walls. One that I shot in a garden near Abádeh belonged, as far as I could judge by the dimensions and description in Jerdon, to this species. I was unfortunately unable to preserve it.—O. St. J.]

9. * ? F. lanarius, L.—De F.

De Filippi states (Viag. in Pers. p. 345) that he recognized the lanner and peregrine amongst the birds employed for hawking.

10. * F. sacer, Gm.

Schlegel, Mus. du Pays Bas, Falcones, p. 11.
Charg or *Charkh*, Persian.

This bird is largely used in hawking in Persia, but, so far as I could learn, the goshawk is much preferred by Persians to all falcons.

Near Píshín in Balúchistán I one day wounded a falcon, but did not bag it. I took it at the time for a *Charg*, but I am not at all sure that it was not a *Laggar* (*F. jugger*).

F. milvipes, Hodgs. apud Jerdon (Ibis, 1871, p. 240=*F. Hendersoni*, Hume), may probably be found in North-eastern Persia. Mr. Sharpe, in the British Museum Catalogue, identifies this bird with *F. sacer*.

[This is the favourite falcon with Persian sportsmen, who use it in the pursuit of houbara (*Houbara Macqueenii*) and of gazelles. Sir John Malcolm, in his inimitable 'Sketches in Persia,' gives an account of a sort of leather breeches being fitted on the *Chargh* by his falconer, the object being to prevent the bird from being torn asunder whilst seizing a hare with one claw, and stopping its course by grasping bushes with the other. I cannot say that I ever saw this done, nor had any of the many Persian falconers I enquired of ever seen or heard of such a practice.—O. St. J.]

11. F. subbuteo, L.—De F.

1 ♂. Pass near Anán, Mazandarán, Elburz mountains .. 9500 .. August 14.

De Filippi obtained a hobby at Marend (Adarbaiján), and I shot one on the Elburz mountains, north of Tehrán, in August. This bird was also noticed by Ménétries near Lankorán, on the Caspian, just beyond the Persian frontier.

12. *F. æsalon, Tunst.

Orn. Brit. p. 1, (1771).
F. regulus, Pall., Reise, ii, p. 707, (1773).—Sharpe, Cat. Birds Brit. Mus. i, p. 406.

Persia is one of the localities given for the merlin in Mr. G. R. Gray's 'Handlist,' but Mr. Sharpe informs me that there is no specimen from that country in the British Museum. There can be no question but that this bird, which is occasionally shot in India, must inhabit Persia.

13. Tinnunculus alaudarius, (Gm.)

1 ♂. Báhú Kálat, Balúchistán	—	Feb. 2.
2 ♂. Near Dizák, Balúchistán	4000	March 21.
3 ♂. Shiráz	5000	June.
4 ♂. Oak forest, near Shiráz	7000	June.

Extremely common throughout Persia and Balúchistán, doubtless leaving the latter country and Southern Persia below the plateau in the summer, and breeding on the Persian highlands.

[Very common all over Persia, particularly in the south, whence it migrates to Arabia in the winter. On the plain of Kamáraj, between Kázrún and Bushire, I have counted over twenty kestrels in the air at the same time, and I once saw no less than thirteen sitting on the telegraph wire between two posts. It is curious that directly the wires were put up kestrels, bee-eaters, and swallows took to perching on them, just as they do in India.—O. St. J.]

14. T. cenchris, (Cuv.)

1 ♂. Mashísh, south-west of Karmán	..	6800	..	May 21.
2, 3, 4, 5 ♂. Oak forest, near Shiráz	..	7000	..	June.

All the specimens obtained agree with the European and African species and differ from Indian and Chinese specimens (*F. Pekinensis*, Swinh.) in their paler colour and in having most of the wing coverts rufous, but in two specimens there is a complete absence of spotting on the ventral surface, showing that this character disappears with age.

[The lesser kestrel is extremely abundant in Southern Persia, less so in the north. The limestone cliffs about the Persepolis plain are favourite haunts of this bird, several pairs breeding regularly among the ruins of the palace itself. Early in March, 1872, I saw a large number of these little falcons collected in the palm groves of the village of Áhrám at the foot of the hills near Bushire. They were probably returning from their winter quarters in Arabia to their nesting places in the north.—O. St. J.]

15. * T. vespertinus, (L.)

F. rufipes, Bechst. apud Mén. Cat. Rais. p. 27.

I can find no record of the occurrence of this bird on the Persian plateau, but as it was found by Ménétries on the Tálish mountains south of Lankorán, it must be included in the Persian fauna. It probably is occasionally found in other parts of Persia.

16. * Astur palumbarius, (L.)—De F.

Tarlán, Persian.

Although the goshawk must be far from rare in parts of Persia, I did not obtain a single specimen, nor did I ever see the bird in the wild state. Yet it must be common in the more wooded parts of the country, for large numbers are kept for hawking by the more wealthy Persians, it being greatly preferred by them to the falcons.

[The goshawk is more frequently kept for sporting purposes in Persia than any of the true falcons, and fetches a higher price. Fifty tomans (£20) are occasionally given for a well-trained female. Many birds are caught in the wooded hills of the south and west, but the majority are brought from the forests of the Caspian. Specimens of the white variety, mentioned by Pallas[1] as occurring in Siberia, occasionally find their way from Astrakhán to the Shah's mews at Tehrán. Persian falconers do not suppose this white bird to be anything more than an accidental variety. A man whom I met in a steamer on the Caspian in charge of some hawks assured me that he had seen a white bird taken out of the nest with two of the ordinary colour. The *Tarlán* is generally flown at the common redlegged partridge, *Caccabis chukor*, and in the south at francolin.—O. St. J.]

17. **A.** (*Micronisus*) **badius**, (Gm.)—De F.

1 ♂. Báhú Kalát, Balúchistán	.. ..	— ..	Feb. 3.
2 ♂. Ghistigán, Balúchistán	.. ..	3000 ..	March 1.
3 ♂. Oak forest, near Shiráz	.. ..	7000 ..	June.

Not rare in Southern Persia and Balúchistán, but I have no proof of its existence in the northern parts of the country, for I consider the migratory form observed by Major St. John at Tehrán to be probably *A. brevives.*

Finsch and Hartlaub (Vög. Ost-Afr. p. 84, note) suggest that the Persian bird called *badius* by De Filippi is *A. brevipes*, and Messrs. Sharpe and Dresser in the 'Birds of Europe' endorse this opinion, which, however, is incorrect. The only locality mentioned by De Filippi is Bandar Abbás, on the authority of Doria (Viag. in Persia, p. 345). I have examined Doria's specimen, which is in the Museo Civico of Genoa, and is labelled from Kusch Kúh in the Germesir (? Laristán). It is unquestionably *A. badius*[2].

Specimens from Southern Persia agree with Indian birds in their dimensions, and appear larger than the North-east African *A. sphenurus*, Rüpp. The bird shot at Ghistigán measured in the flesh, length 13.3 in., wing 7.25.

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[1] Zoogr. Ros. As. i, p. 368.

[2] On examining the specimens of *A. brevipes* in Mr. Dresser's collection, and in that of the British Museum, I find that the species differs from *A. badius* not only in its larger size, but also in the characters of its primaries, thus: in *A. badius* the fourth primary is the longest, the first four primaries are emarginate on the inside near the tip, and the third, fourth, and fifth on the outside. In *A. brevipes* the third quill is the longest, the first three are emarginate inside, and only the third and fourth on the outside.

18. A. (*Micronisus*), sp.

? *Astur cenchroides*, Severtzov, Turk. Jev. p. 113.

1 ♀. Near Bampúr, Balúchistán .. 1800 .. April 8.

I do not like to give a name to a single specimen, which may prove only an individual variety of *A. badius*, but the differences in size are such that I cannot identify it with that species at present. The following is a description of the specimen, which I shot in the wooded plain west of Bampúr.

Above hair brown with an ashy tinge, tail paler and more ashy, central rectrices unbanded, except one broad black band close to the end, laterals, except the outer pair, with five black bands, the last near the tip and broadest, outer pair with about seven or eight fainter and narrower imperfect bands. Chin and upper throat whitish with a distinct central stripe, lower parts pale ferruginous with white cross bands, broader and farther apart than they usually are in *A. badius*, there being on the breast only about four white and four ferruginous bands to an inch; the white bands are about the same breadth as the ferruginous ones, and the colour of the latter is deeper and brownish at their edges. Lower abdomen white. The quills are banded almost to the tips. Iris deep yellow, cere pale straw colour, bill black above and towards the tip, bluish grey at base below, legs yellow, claws black. Dimensions taken before skinning: length 15.5 in., wing 8.85, tail 7, tarsus 2.3, hind toe without claw 1.4, bill from end of cere to tip measured round the curve 0.6, from gape to tip 0.85, length of cere 0.35, wings short of the end of the tail 3.75.

The fourth and fifth quills are equal and longest, the first is 2.6 in. shorter, second 1.25, third 0.3. The ends of the first four quills inside, and of the third, fourth, and fifth outside, are emarginate, as in *A. badius*.

It is evident that this is not *A. brevipes*. It is, however, very large for *A. badius*, the extreme measurements given by Hume (Scrap Book, i, p. 118) being, in the female, wing 8.3, tarsus 2. Mr. J. H. Gurney has kindly compared my specimen with the series of *A. badius* at Norwich, and informs me that the tarsus is longer than that of the largest specimen there preserved by 2½ lines, and the hind toe by 2 lines; but one of the specimens measured by Hume has the hind toe of the same length as that from Bampúr. Mr. Gurney too has skins from Madras and Siam with the wing as long as in the Balúchistán bird.

The colouration in *A. badius* varies much, and I have seen specimens differing very little from that above described.

19. * A. (*Micronisus*) **brevipes**[1] ? Severtzov.

I think it very improbable that the migratory hawk mentioned by Major St. John in the following note can have been *A. badius*, which is not a migratory bird, and no specimen of which has been procured in Northern Persia. On the other hand, *A. brevipes* is believed to be migratory, and is found in South-eastern Europe and Asia Minor in summer. Nothing is more probable than that it should traverse Persia in its migration to its winter quarters, which may very possibly be in Arabia.

[A sparrowhawk, which I identified with *Micronisus badius*, is a bird of passage in Persia. It passes over Tehrán in considerable numbers in April and October. In captivity I have only seen it in the Shah's mews.—O. St. J.]

20. Accipiter nisus, (L.)—De F.

Báshá, Persian.

1 ♂, 2 ♀. Oak forest, near Shiráz .. 7000 .. June.

Common throughout Persia, but probably not found in the lowlands of Southern Persia in summer.

[The sparrowhawk is found everywhere in Persia in the closely-planted fruit gardens about towns and villages. Sparrow catching with the '*Báshá*' is one of the favourite summer pastimes in Persia, when the weather is too hot for more arduous sports. The quarry is flushed from one of the kanáts, or openings of the subterranean irrigation channels, which abound round towns and villages, and the hawk, thrown from the hand, rarely fails to seize her prey before it can dash down the next kanát, for which it always makes the instant it perceives itself pursued. Occasionally the hawk follows the sparrow down the well, from which there is usually much difficulty in extricating it; valuable birds are sometimes lost in this way. A good sparrowhawk will kill fifteen to twenty sparrows in the course of an hour's walk. Its docility is wonderful: a week after capture the bird is taken out, with a string fifteen or twenty yards long tied to one leg, and is flown at sparrows.

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[1] On the structural differences between this bird and *A. badius*, see note to p. 107.

A few days' practice renders the string unnecessary, and the hawk comes readily to the lure. The female is occasionally used for catching quail.—O. St. J.]

21. * Circus æruginosus, (L.)—De F.

I do not recollect observing the marsh harrier in Persia, though it must, I think, occur in the highlands, even in summer.

[The marsh harrier is common in the reedy marshes in which many Persian streams terminate. I believe it migrates from the lower to the higher valleys in summer.—O. St. J.]

22. C. macrurus, (S. G. Gm.)

Accipiter macrourus, S. G. Gmel. N. Comm. Petrop. xv, p. 439, Pl. VIII and IX.
C. Swainsoni, South African Quart. Jour. i, 384, 1830; S. Af. Zool. Pl. XLIII, XLIV.
C. pallidus, Sykes, P. Z. S. 1832, p. 80.

1 ♂, 2 ♀. Gwádar, Balúchistán coast .. .. December.

I only saw harriers in Balúchistán. I noticed none on the Persian plateau in summer.

I have only evidence of the occurrence of *C. macrurus* and *C. cinerarius*, but there can be no question that *C. cyaneus,* which extends into India in winter, also visits Persia.

[The pale chested harrier is very common in Southern Persia at particular times of the year. It appears about the plains on the coast in March, beating up and down the green cornfields. As these are cut it gradually works its way northwards, but I have never seen it late in the summer. I have never obtained the harrier that visits the plains about Tehrán in winter; but I think that it is darker grey than that of the south; if so it may be *C. cyaneus.*—O. St. J.]

23. * C. cinerarius, (Montague.)

C. Pygargus, (L.) Sharpe, Cat. Birds Brit. Mus. p. 64, *nec* Linn.

[I shot a Montague's harrier at Shápúr about the end of April, 1864.—O. St. J.]

24. * ? Aquila chrysaëtus, (L.)

Mr. Hume (Stray Feathers, vol. i, pp. 49, 157) mentions having seen a bird, which he says could be no other than this species, on the Makrán coast. Probably the golden eagle is found in many parts of Persia, and it is by no means impossible that the great *Berkut* of Mongolia may also be met with (conf. Ibis, 1866, p. 240).

25. *A. heliaca[1], Sav.

A. imperialis, (Bechst), auctorum.
A. mogilnik, (S. G. Gmel.), Dresser, Birds of Europe.

I saw very few eagles in Persia, and when seen they were usually too distant for the species to be ascertained. On one occasion I found a splendid imperial eagle dead, having probably been shot, in the middle of the road near Khán-i-Súrkh, between Karmán and Shiráz. The spot was on a high pass more than 8000 feet above the sea. The bird measured 32 in. in length from the tip of bill to end of tail, 6 ft. in expanse, wing 24.5 in., tail 14, claw of middle toe round curve, 1.65. These dimensions equal those of the largest Indian imperial eagles.

Aquila Nipalensis, Hodgs. (*A. bifasciata*, Gray) is probably also Persian, and we may expect at least one of the *A. rapax* group to inhabit the southern parts of the country.

26. *A. clanga, (Pall.)

A spotted eagle has been procured in Persia by Major St. John, but I did not meet with it myself. Ménétries shot one on the Tálish mountains. There are two specimens in the British Museum brought from Bághdád by Mr. Loftus, and Mr. Sharpe, to whom I am indebted for calling my attention to them, informs me that they belong to *A. clanga*, so it is highly probable that the other specimens mentioned are of the same species. At the same time, the latter may have belonged to *A. hastata*, Less., which is probably Persian. *A. maculata*, Gm. (*A. nævia*, auct.) is not known to extend so far to the eastward.

[A young eagle, closely corresponding in colouration and dimensions to the description and figure of *nævia* in Yarrell's 'British Birds,' was brought to me in Shiráz. I kept it for some days, when it escaped.—O. St. J.]

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[1] As there appears some doubt whether S. G. Gmelin's *Falco mogilnik* really applies to this bird or to *A. nipalensis* v. *bifasciata*, it seems desirable to get rid of the name, which, like several others given by the same author, is objectionable.

27. *Aquila pennata, (Gm.)

[A small eagle, probably this species, is not uncommon about the palm groves and gardens of Southern Persia; one carried off a roller that I had shot on the wing, almost before the bird fell to the ground. The eagle must have perched on a palm tree over head.—O. St. J.]

28. A. fasciata, Vieil.

Falco Bonellii, Temm.

1 ♂. Bampúr, Balúchistán .. 1800 .. April 6.

The only specimen obtained. It was shot sitting on a tree on the banks of a stream. I believe I saw the same eagle on other occasions.

Circaëtus gallicus must exist in Persia, but I cannot find its occurrence recorded.

29. Haliaëtus albicilla, (L.)

1 ♂. Gwádar, Balúchistán coast .. .. December 26.

There were two or three pairs of this sea eagle at Gwádar, and one bird was secured by my collector by careful stalking. They were very wary, and although I expended much time in trying to circumvent them, I never bagged a bird.

The European white tailed sea eagle has been found by Mr. Hume in several parts of North-western India, so its occurrence on the Persian coast was to be expected.

H. albicilla is also found on the Caspian.

30. * H. leucoryphus ? (Pall.)

The bird mentioned in the following note is certainly not *H. albicilla*, which has a pure white tail. *H. leucoryphus*, Pallas, which occurs both on the Caspian and in India, and is, in all probability, found in Persia, has most of the basal portion of the tail beyond the coverts white, with a broad dark terminal band. This is in all probability the bird noticed by Major St. John.

[A large sea eagle is common about Bushire, where I have often seen it sitting on the stakes set up in shallow water by fishermen. I have also frequently noticed it in summer about the Kázrún and Dashtiarjan lakes. It is recognisable by the broad dark band in the middle of the white tail.—O. St. J.]

31. **Butastur teesa**, (Frankl.)

1 ♂.	Gwádar, Balúchistán		Jan. 15.
2 ♂.	North-west of Bampúr, Balúchistán	1600	April 10.

Not rare in Balúchistán, but keeping, as a rule, to the more wooded tracts. Of course it is not found in the Persian highlands, and I cannot say how far it ranges to the westward, but possibly to the head of the Persian Gulf. Its appearance so far west is singular, for its range extends to Burmah.

32. **Buteo ferox**, (Gm.)

1 ♂.	Píshín, Balúchistán	500	February 11.
2 ♀.	Shíráz	4750	(?)

Perhaps the commonest of Persian *Raptores*.

I have seen no skins of any other buzzard from Persia, but I think *B. vulgaris* probably occurs, and also *B. desertorum*, Daud., or at least the smaller Indian buzzard, usually known by that name (*B. rufiventer*, Jerdon).

[A large buzzard, which I have always considered to be *vulgaris*, but which may be *ferox*, is very common in Persia, both in the desert plains and the more fertile valleys of the south. A dozen or more are generally seen in the course of a day's march in winter through any part of Fárs.—O. St. J.]

33. * ? **B. hemilasius**, Temm. and Schl.

B. Asiaticus, Blyth, Ibis, 1866, p. 244.

I can only suggest that this may be the bird noticed by Major St. John. The size given is rather large, but I know of no other large buzzard with the tarsi half feathered. *B. hemilasius* has been found occasionally in the Himalayas, and is, according to Mr. Swinhoe, Ibis, 1873, p. 364, not rare in Northern China, and as it is evidently an Eastern Palæarctic form, there is nothing surprising in its occurrence on the Persian highlands.

[In December 1866, I shot, near Persepolis, an eagle or eagle buzzard nearly answering to Jerdon's description of *A. hemiptilopus*, but with tarsi feathered only half way down. The length was 26½ in., wing 21 in.—O. St. J.]

34. Milvus migrans[1], (Bodd.)—De F.

M. ater, (Gm.), De F. Viag. in Pers. p. 345.

1, 2 ♀. Khairabád, south-west of Karmán .. 5700 .. May 29.

Of a third specimen obtained in the same neighbourhood the label has been lost.

The common black kite of Europe was the only species obtained in Persia. It was not very common. I nowhere observed it so abundant as Ménétries found it in the Tálish mountains, where he says there was a pair, at least, about every village.

Kites were singularly scarce in Balúchistán, and I only saw them at one or two places, the principal being Báhú Kalát, where, however, I had no success in shooting, as, although I wounded one bird, I bagged none. This was unfortunate, because it leaves the species uncertain, and I can only say that I think it was *M. govinda*, which Hume found abundant in Sind.

[Kites are not so common in Persia as in most parts of the East. About Shiráz a few seem to breed, but leave for the warmer plains in the winter.—O. St. J.]

Family PANDIONIDÆ.

35. Pandion haliaëtus, (L).

1 ♂, 2 ♀. Gwádar, Balúchistán coast .. .. December.
3 ♀. Gwádar, Balúchistán coast .. .. January 23.

The osprey is common on the Balúchistán coast, but, of course, seldom seen in the interior of Persia, where there are so few rivers. I saw it in the Elburz mountains, and it is common about the Caspian.

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[1] S. G. Gmelin's name, *Korschun*, is given by Sharpe, Brit. Mus. Cat. p. 322, for this bird. I decline to adopt so utterly barbarous a title, which I do not consider a Latin name at all. If adopted, the orthography should be Latinized at least; as it stands it is simply a German rendering of a Russian word. Moreover, Pallas, Zoogr. Ros. As. p. 356, makes it synonymous with his *Accipiter regalis*, and I am by no means inclined to believe, with Mr. Sharpe, that this is *M. migrans*. It is described '*cauda forcipata, corpore ferrugineoscente*,' which surely applies to *M. ictinus* (*regalis*); whilst Pallas's *Accipiter milvus*, described as '*cauda subforcipata, corpore fuscescente*,' must, I think, be *M. migrans*. It appears highly probable moreover that Gmelin's figure represents *Circus æruginosus*!

FAMILY STRIGIDÆ.

36. **Bubo Sibiricus**, Eversman.

Addenda ad Cel. Pall. Faun. Ros. As.—Susemihl's Vögel Europa's, Pl. XLIV.
B. cinereus, Gray, Genera of Birds, Pl. XIII.
B. maximus, var. Jerdon, Birds of India, vol. ii, Appendix, p. 870.'
B. Hemachalana, Hume, Stray Feathers, i, p. 315.

1 ♀. Near Shiráz	.. .. ..	6000

This race, which is closely allied to *B. ignavus*[1], Forst. (*B. maximus*, auct.), but distinguished by its much paler colour, and by the smaller extent of the black stripes on the head, neck, and breast, appears to have a wide range in Asia. I have only seen two specimens, that from Shiráz, and a magnificent female in the British Museum, but they agree well. The Shiráz specimen measures: wing 17, tail 9.5 in.

[I twice obtained specimens of this splendid owl. A winged bird, shot in the gardens near Shiráz, was brought to my house in May 1867, and remained alive for several days. Two years afterwards, when encamped on the banks of the Kárá-agatch river, twenty miles west of Shiráz, my collector shot one while drinking at the river in the day time. A pair of large horned owls, probably of this species, reside in the cliffs (above Naksh-i-Taimúr), at the north-west corner of the Kázrún lake. When putting up the telegraph at this spot, I used to see them sitting out on the rocks every morning and evening looming large against the sky. I tried hard to stalk them, but unsuccessfully.—O. ST. J.]

37. **Scops giu**, (Scop.)

Strix giu, Scopoli, Ann. Hist. Nat. p. 19.
S. zorca, Gm. Syst. Nat. i, p. 289.
Búf, Persian.

1. Shiráz	.. ..	4750

The common *Scops* abounds in gardens on the Persian highlands. There is scarcely a village with large trees in which the monotonous note of this little owl may not be heard, commencing when it grows dark in the evening, and continuing at intervals throughout the night. An especially favourite tree is a thick cypress.

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[1] Dresser, in the 'Birds of Europe,' has united *B. Sibiricus* and *B. ignavus*, but if all Asiatic specimens of the former are as pale as those I have seen, I think they are fairly deserving of separation.

The only specimen collected was shot by Major St. John, at Shiráz in April. I have often tried to shoot these birds, but as they keep to the thickest trees, never stir abroad in the day, and do not commence to call till it is just too late to see them, it is not easy to secure specimens.

[Though these little owls are not often seen, there is not a garden of any size in Persia which does not contain a couple, at least, which make night hideous with their melancholy cry. The immense cypress trees in the gardens of Shiráz swarm with Scops owls. They leave the plateau in winter, returning in March; at least, I shot one, which was evidently quite tired, out of a tamarisk tree, near Bushire, on the 15th of that month. It was apparently in a phase of plumage intermediate between the grey and rufous.—O. St. J.]

38. **Otus vulgaris**, (Flem.)

1 ♀. Foot of the Elburz mountains, 50 miles south of the Caspian, near Resht	.. November.

This bird was obtained by Ménétries in the forests of Laukorán, and by Major St. John near Shiráz. It is found in the north-west Himalayas and, in winter, in the Panjáb.

[I got two specimens of this bird in localities widely apart, though not very dissimilar in character. The first was shot in the willow jungle which covers the broad bed of the little river Kárá-agatch, in Fárs, about 6000 feet above the sea. My companion, who killed it, took it for a woodcock. The second was procured by my collector in a clump of the poplar willow on the banks of the Sháhrúd, about fifty miles from the Caspian. Both places are a dozen miles from anything like forest.—O. St. J.]

39. * **O. brachyotus**, (Gm.)

I did not meet with the short-eared owl, but it has been observed by Major St. John. According to Ménétries, it is common in the Caucasus.

[I only once came across this bird in Persia, and then in considerable numbers. Early in March 1867, I was in camp about twenty miles from Bushire. Riding, about noon, through a plain covered with scanty dwarf vegetation, I put up first one and then several owls, which were apparently so tired that they hardly took the trouble to get out of the horse's way. On returning to camp, an hour or so afterwards, I went out with my gun and secured a specimen, finding the flock in the same place. There were twenty at least. The next day not one was to be found. They were probably resting after their flight across the Gulf from Arabia, having alighted in the first dry place they found after reaching the shore. I am not sure of having seen the short-eared owl anywhere else in Persia, but I have put up an owl more than once while shooting amongst reeds, which may have belonged to this species.—O. St. J.]

40. **Athene glaux,** (Sav.)—De F.

Noctua glaux, Sav. Descr. Egypte, p. 459, Pl. XII, (1809); Oiseaux d'Egypte, p. 105, (1810).
Strix Persica, Vieil. Nouv. Dict. vii, p. 26, (1817).
Athene meridionalis, auct. (nec Risso, conf. Salvadori, Fauna d' Italia, pt. ii, Uccelli, p. 30).
A. noctua, var. *Persica* (L. Bp.), De F. Viag. in Persia, p. 345.
A. Bactrianus, Blyth, J. A. S. B. 1847, xvi, p. 776.

1, 2 ♂. Niriz, east of Shiráz	5500 ..	June 2.
3, 4 ♂, 5 ♀. Shiráz	4500 ..	June.
6 ♂. Yazdikhást, between Shiráz and Isfahán	7000 ..	July 1.

I much doubt whether this bird is the same as that described from Swát in Afghánistán by Mr. Hume (Scrap Book, part i, no. 2, p. 407, note.) The latter was smaller (wing 5 in. only), and, from the description, greyer above, 'with greyish white blotches on the head, nape, and base of the neck.' In *A. glaux* there are elongate white spots on the head and nape, whilst broad white rather irregular spots form a half collar on the back of the neck. Then in Mr. Hume's bird the tail has three conspicuous, narrow, transverse, greyish white bands visible, and a fourth nearly hidden by the upper tail coverts. In *A. glaux* there are four rather broad, imperfect, rufous white bands on the tail. There are several minor differences in the colouring of the head, and no mention is made of the conspicuous white or whitish spots on the mantle. On the other hand, the description of Mr. Blyth's *A. Bactriana*, l. c., agrees exactly with my specimens from Persia, and with one from Egypt lent to me by Mr. Dresser for comparison, although the species is classed as distinct by Gray in his 'Handlist.'

A. nudipes, Hodgs., of which specimens exist in the British Museum, appears distinct from *A. glaux*. In the former the toes are feathered above to the base of the claws. I do not think Hodgson's species has ever been described.

A. glaux is common on the Persian highlands, keeping mostly to rocks, especially masses of rock isolated in a plain, or to the ruined buildings of unbaked brick, which are so common throughout Persia. It lives in holes during the day, and may often be seen in the early morning and in the evening sitting upon rocks or walls. It is rather gregarious, five or six being often seen together, and, like others of the genus, is much more diurnal than most owls in its habits.

[These owlets are found in such dissimilar situations, that I cannot help thinking there must be two species at least. The great desert plains of the interior abound with small owls of this genus, which occasionally breed in holes in the ground, but oftener in fissures in rocks. I once shot a pair perched on a stone which projected through the snow on the plain of Dehbíd, nearly 8000 feet above the sea. The same, or more probably an allied species, is found in ruined houses, and other such congenial resorts, quite down to the shores of the Gulf.—O. St. J.]

41. * A. noctua, (Retz.)

Strix passerina, Gm. apud Mén. Cat. Rais. No. 41, p. 28.

Common at Lankorán, according to Ménétries. It is not probable that *A. glaux* is found in forests, and I think it very likely that the common European little owl replaces it in the Caspian provinces.

A. passerina, (L.) and *Syrnia ulula*, (L.), both of which are recorded by Eichwald from the shores of the Caspian, probably inhabit Ghílán and Mazandarán.

42. A. Brama, (Temm).

1 ♀.	Kalagán, Balúchistán	3500 ..	March 9.
2 ♀.	Bampúr, Balúchistán	2000 ..	April 6.

This little Indian owl is not abundant in Balúchistán, and appears only to occur in well wooded localities. It is doubtless one of the Indian forms, extending along the coast and its neighbourhood to the Persian Gulf, and it is replaced on the Persian highlands by *A. glaux*, the habits of which are quite different, it being apparently a rock-haunting bird.

Although it is thus evident that *A. Brama* extends for some distance to the west of India, my researches confirm Mr. Blyth's opinion (Ibis, 1866, p. 257), that Dr. Jerdon was in error in supposing that its range extends to 'Persia and other parts of Asia,' if Persia proper, i. e. the high country, was meant. It is rather curious to find that Mr. Blyth, in his note, speaks of the asserted occurrence of *Noctua Indica* (=*A. Brama*) at Erzeroum as the only authority for noting the bird from Persia. It is not likely that Mr. Blyth would forget that Erzeroum is in Turkey, although it was at one time a popular delusion amongst ornithologists that this town was Persian.

I cannot learn that any true *Strix* has been seen in Persia, though one might be expected to occur. *Ketupa Ceylonensis*, too, which has been found in Palestine and India, should be looked for. The snowy owl, *Nyctea Scandiaca*, L., was recorded from Astrakhan by Pennant, and it has lately been obtained by Mr. Hume from the frontiers of the Panjáb. If the bird obtained at the last named locality be correctly identified, this species probably inhabits Northern Persia also.

ORDER INSESSORES.

SUB-ORDER COCCYGES.

FAMILY CUCULIDÆ.

43. Cuculus canorus, L.—De F.

1 ♂. Mashísh, south-west of Karmán, Southern Persia	7500	May 21
2, 3 ♂, 4 young ♀. Near Shiráz	5000	May.
5 young ♂. Shiráz	4750	June.
6 young. Near Sarvistán, east of Shiráz	6000	June 5.
7 young ♂. Shiráz	4500	July.

The common cuckoo abounds in parts of Persia, and must breed early. I saw a cuckoo, and heard the well-known note repeatedly amongst the Balúchistán hills, in a region almost devoid of trees, in the months of February and March, at an elevation of from 2000 to 4000 feet above the sea. The first cuckoo was heard near the Nihing river on the 18th of February. I scarcely think it probable, however, that these birds were breeding so early, or that they selected a place so singularly devoid of bird life in general as were the hills on the Nihing river. I am rather inclined to suspect that all seen in Balúchistán migrated about March to the Persian highlands, for after first meeting with them, I observed few or none until after passing Karmán in the beginning of May. Thence to Shiráz they were common, and many doubtless breed on the wooded hill sides and valleys of Fárs, for I procured one young bird in June, and Major St. John, at Shiráz, obtained several in May, June, and July. Throughout the comparatively bare Persian table land from Shiráz to Tehrán I occasionally saw cuckoos in and about gardens, but in the valleys of the Elburz mountains, north of Tehrán, they abounded to an extent I have never seen elsewhere. One or two birds appeared to haunt each one of the rows of poplars which are planted everywhere in the bottoms of the valleys, where there is sufficient soil for cultivation.

[As may be supposed, the cuckoo is common all over Persia, the southern parts of which it probably does not leave during the winter. I heard one calling in the lower hills, near the sea, on the 25th of January, and shot a bird in the brown plumage at Kohrúd, 7500 feet above the sea, and 500 miles from it, in the first week in April.—O. St. J.]

44. Coccystes glandarius, (L.)

1. Sarvistán, east of Shiráz, Southern Persia .. 5000 .. June 7.

I only saw the great spotted cuckoo on one occasion; three or four were together in some large willow trees on the banks of a kanát (irrigation channel) just outside the village of Sarvistán. They were rather wary, but Major St. John was fortunate enough to secure one specimen.

[Sometimes this cuckoo is extremely abundant in favourable places throughout Southern Persia; in other years again, I have not noticed one. During the two summers that I had a collector, I was unable to procure a single specimen, though I tried hard in places where I had seen many in former years. The thick willow and 'sinjít' jungles in the beds of streams appear to be its favourite resorts. In the summer of 1864 there were dozens breeding about the Kárá-agatch river, twenty miles west of Shiráz. Here, when superintending the erection of the telegraph, I had a good opportunity of observing their habits. I first saw them early in May. They probably do not pair, as several males were often seen pursuing a single female; and, from the continual quarrelling which went on between them and the swarms of magpies, which breed in the same locality, I fancy that the latter were resenting the intrusion of the cuckoos' eggs in their nests. The magpie is, perhaps, the natural stepmother of the young spotted cuckoos, the eggs of the two birds being similar. The next and the following year, though I was frequently in the same spot, I saw no cuckoos, but in 1867 I remarked them again about the Kárá-agatch, and also in the jungly bed of the Polvar, further north; after which I saw none till with Mr. Blanford, when I shot one out of a few willow trees near Sarvistán.—O. St. J.]

Family ALCEDINIDÆ.

45. Halcyon Smyrnensis, (L.)—De F.

1, 2 ♀. Píshín, Balúchistán	5000	Feb. 9.
3 ♀. Khisht, 50 miles north-east of Bushire	1800	Jan.
4 ♀. Kázrún, between Khisht and Shiráz	2750	Jan.
5 ♀. Basrah (Bussorah)	—	Dec. 16.

De Filippi only obtained this bird from Shiráz, and it does not appear to have been found hitherto in Northern Persia. In Southern Persia and Balúchistán it appears to be found not unfrequently, wherever there are trees in any number.

[This kingfisher is not uncommon in Southern Persia, ascending to considerable altitudes. I have seen it in winter in the valley of Dashtiarjan, 6500 feet above the sea. It is numerous in the swampy palm groves of the lower valleys, but does not appear to be so fond of gardens as in India. I have not noticed it north of Shiráz in Persia, but it occurs in Mesopotamia.—O. St. J.]

46. Alcedo ispida, L.—De F.

1, 2 ♂. Píshín, Balúchistán,	500	Feb. 11.
3 ♂, 4 ♀. Kalagán, Balúchistán	3500	March 18.
5 ♀. Shiráz	4500	(?)
6, 7 young. Near Shiráz	6000	(?)
8. Isfahán	5000	(?)
9 ♂, 10 ♀ (both young). Isfahán	5000	July 10.

Mr. Hume (Stray Feathers, i, pp. 44, 168) has already pointed out that the Sind kingfisher is *A. ispida*, and not *A. Bengalensis*, although the latter is found at Maskat, in Arabia, near the entrance to the Persian Gulf, a circumstance which was mentioned to me by Major St. John, and has also been noticed by Mr. Hume. Every specimen obtained in Balúchistán and Persia appears to me clearly to belong to the European species[1].

[*Alcedo ispida* is the commonest kingfisher in Persia, and is found everywhere, in suitable localities, from the Caspian Sea to the Persian Gulf. I thought at one time that those found in the south were referable to *A. Bengalensis*, and I still believe that those so numerous under the cliffs about Maskat are of that species.—O. St. J.]

47. **Ceryle rudis**, (L).

1, 2 ♂, 3 ♀. Near Shiráz	6000	August.
4 ♂. Khisht, 50 miles north-east of Bushire	1800	Jan.
5 ♂. Basrah (Bussorah)	—	Dec. 19.

Rare in Persia. The only place where I saw it common was at Basrah, on the Shat-el-Arab (Euphrates' estuary), which is outside Persian territory. Though found near the Black Sea, this bird has not, so far as I know, been observed on the Caspian.

[*Ceryle rudis* is the rarest kingfisher in Persia, though seen occasionally on the rivers of both South and North. In Central Persia I have only remarked it on the canals about Isfahán.—O. St. J.]

FAMILY MEROPIDÆ.

48. **Merops apiaster**, L.—De F.

1 ♂ Near Karmán, South-eastern Persia	5800	May 17.
2 ♀. Near Niríz, east of Shiráz	5000	June 5.
3, 4, 5, 6 ♂, 7, 8 ♀. Shiráz	4750	June.
9, 10 ♀. Isfahán	5000	Sept.

The common European bee-eater is a summer migrant in Persia, and during the warm months it abounds throughout the highlands. I met with it first in Balúchistán, on the 9th of April; but there, as in Sind, it is, I suspect, only a bird of passage, and its breeding quarters are farther north, but large numbers undoubtedly remain during the summer, and breed on the Persian highlands. The same remark applies to the next bird, and to *Coracias garrula*, none of these species being found in India in the winter, although they traverse Balúchistán, Sind, and occasionally North-western India in the spring and autumn[1], so that it is probable that all of them pass the colder months of the year in Arabia or Africa, and their line of migration crosses at right angles that of such species as *Euspiza melanocephala* and *Coturnix communis*, which, as will hereafter be shown, resort to India in the winter, and breed in the Persian highlands.

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[1] Dr. J. Anderson, in the Ibis, 1871, p. 372, on Major St. John's authority, quoted the occurrence of *A. Bengalensis* at Shiráz. A comparison of specimens, however, shows that the name was applied by mistake to the young of *A. ispida*.

[I have more than once, when in camp between Shiráz and the sea, seen large flocks of bee-eaters making their way northwards about the end of March. They are common throughout the summer at all elevations between 2500 and 6000 feet, breeding generally in the irrigation shafts or kanáts, in company with sparrows, pigeons, and rollers.—O. St. J.]

49. M. Ægyptius, Forsk.—De F.

Forskal. Descr. An. p. 1.
M. Persicus, Pall. Reise, App. p. 708.—Zoogr. Ros. As. i, p. 440.—De F. Viag. in Pers. p. 346.
M. superciliosus, Finsch, Jour. f. Orn. 1867, p. 239.—Tr. Z. S. vii, p. 223.—W. Blanf. Geol. Zool. Abyssinia, p. 321 : nec Linn.

1, 2 ♂. West of Bampúr, Balúchistán	1600	April 8.
3 ♂. Rígán, Narmashír, south-east of Bampúr	2500	April 18.
4 ♂ (immature). Shiráz	4700	June.
5 ♂, 6, 7 ♀ (immature). Shiráz	4700	Summer.

I believe that both Dr. Finsch and I were in error in considering this bird identical with *M. superciliosus*, L., for on comparison with specimens from Madagascar, whence Linnæus's type was derived, there appears to be a well marked difference. The adult bird from Madagascar has a much more ferruginous brown tinge on the head and upper back, and scarcely any blue on the supercilia, sides of throat below the dark eye streak, rump, upper and lower tail coverts, and abdomen. The long central tail feathers, too, in *M. superciliosus* are much more gradually attenuate, and considerably longer than in *M. Ægyptius*. The following are measurements :—

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[1] I do not know if these birds ever breed in India; perhaps a few may do so, but doubtless the majority pass on to higher latitudes.

	Length of tail to end of central rectrices.	Central rectrices beyond next pair.
Persia (2 adults measured)	5.6 to 5.7	2.0 to 2.07
Egypt (5 adults measured)	4.85 to 5.27	1.5 to 2.1
Madagascar (1 adult measured)	6.3	2.8

Immature specimens of the two forms appear undistinguishable, but young examples of the very distinct *M. Philippinus*, L., can only be recognised by their blue tail.

I found *Merops Ægyptius* in great abundance in the country north-west of Bampúr in Balúchistán, and in Narmashír, the Persian district traversed on the road from Bampúr to Bam, in the second and third week of April 1872. The birds were evidently migrating, and all which I shot were in superb plumage. Hume remarks (Stray Feathers, i, p. 167) that large numbers are seen in Sind at particular seasons, probably in the same manner, when migrating, and the bird has been observed as far east as Aligarh (Ibis, 1872, p. 203). On the Persian highlands I seldom saw this species, *M. apiaster* being very much more abundant; but a few miles from Tehrán, on the 22nd of August, I came upon a large scattered flock of *M. Ægyptius*, chiefly consisting of young birds. The place was a somewhat barren plain, with a few scattered shrubs and herbaceous plants, and the birds settled on the ground, occasionally flying up to pursue insects. They may have been migrating, or preparing to migrate. De Filippi obtained specimens at Miána and Nikbeg, between Kazvín and Tabriz, and Ménétries saw it on the banks of the Kúr, in the Transcaucasian provinces of Russia, a little north of the Persian frontier.

[This is much rarer than the last species. It arrives from Arabia somewhat later in the season, and many appear to remain and breed about the coast, which *M. apiaster* does not.—O. St. J.]

50. **M. viridis**, L.—De F.

1, 2 ♀. Gwádar, Balúchistán coast	—	Dec.
3 ♀. Gwádar, Balúchistán coast	—	Jan. 17.
4 ♀. Dasht river, near Gwatar Bay, Balúchistán	—	Jan. 26.
5 ♂. Bampúr, Balúchistán	2000	April 5.
6 ♀. Khisht, 50 miles north-east of Bushire	1800	Jan.
7 ♀. Bushire	—	Jan.

This Indian species is of course non-migratory, and is only found in the lowlands of Southern Persia and Balúchistán. All the specimens have a distinctly blue chin and throat, and in this respect agree with the Indian race (*M. torquatus*, Hodgs.), whilst the upper plumage resembles that of the African *M. viridissimus*, there being in no case the ferruginous tint on the head seen in many Indian specimens. As a rule, Indian birds have a decidedly longer bill than those from Egypt, and in this respect all Persian and Balúchistán specimens agree with Egyptian.

[*Merops viridis* is common on the coast, and in the neighbouring valleys up to 2000 feet. It extends to Basrah.—O. St. J.]

Family CORACIADÆ.

51. Coracias garrula, L.—De F.

1 ♂. North-west of Bampúr, Balúchistán	2000	April 13.
2 young ♂. Shiráz	4750	June.
3 young ♂. Shiráz	5000	—
4 ♂. Kázrún, west of Shiráz	2750	May.
5 young ♂, 6 ♀. Eklíd, between Shiráz and Isfahán	6700	—
6 young ♂. Isfahán	5000	July 10.

The European roller is a migratory bird in Persia, arriving in the spring and breeding on the highlands. In Balúchistán, which country it traverses in the same manner as *Merops apiaster* and *M. Ægyptius* do, I first saw it on the plains near Bampúr, in the second week in April. I doubt if it remains there to breed. Most probably both this roller and the two bee-eaters cross the hot regions near the shores of the Indian Ocean and the Persian Gulf, and betake themselves to the highlands of Central Asia, Persia, Afghánistán, Turkestán, etc. So far as I know, none remain in Southern Persia in the winter, all cross over into Arabia. Whether they remain there or continue their journey to Africa we shall probably learn when some adventurous ornithologist explores the oases of Central Arabia, the hills and valleys of Omán, and the palm groves of the coast north of Maskat. I did not notice any rollers at Basrah in December, but the chilly climate of Mesopotamia at that season is ill suited for a purely insectivorous bird, and it is far more probable that this species would be met with in the extensive date palm groves which line many parts of the

Arabian coast in the Gulf of Omán and the Persian Gulf, just as *C. Indica* inhabits those on the Persian shores of the same seas.

I believe that *C. garrula* in Persia usually nidificates in holes in banks, and sometimes perhaps in the mud walls which enclose all the houses and gardens of Persian cities. Many observers, e.g. Tristram in Palestine, Finsch, Lilford, and Lindermayer in Greece and Turkey, have noted instances of nests made by this bird in banks and walls. Near Shiráz, at the beginning of June, I saw a pair engaged about a hole in a bank, in which they appeared to have a nest. The hole was deep and I could not wait to excavate sufficiently to ascertain if it contained eggs or young. Outside the Armenian quarter of Julfa, at Isfahán, there are miles of high walls made of earth which enclose abandoned gardens, and upon these walls in July young rollers abounded, whilst I did not notice any on the trees in the city. In many places these birds were by no means wary; but when they were migrating in Balúchistán, I saw many and pursued several before I could secure a specimen.

[The common roller seems to leave Persia altogether in the winter, reappearing in Bushire, on its way north, about the end of March or beginning of April. It is found in the summer all over Persia, at all habitable altitudes, generally breeding in ruined mud walls, or kanáts.—O. St. J.]

52. C. Indica, L.—De F.

1 ♀.	Píshín, Balúchistán	500	Feb. 7.
2 ♀.	Ghistigán, Bampusht, Balúchistán	3000	March 1.
3 ♀.	Khisht, 50 miles north-east of Bushire	1800	Jan.

The Indian roller inhabits somewhat sparingly the countries of Southern Persia and Balúchistán which are below the level of about 3000 feet above the sea, its range in these countries being nearly the same as that of the date palm. De Filippi, on the authority of the Marchese Doria, gives as its habitat, in Persia, 'beyond Isfahán in the region of the palms;' but no palms are met with so far north as Isfahán, except on the edge of the salt desert north of Yezd, and I think that beyond (i. e. south of) Shiráz would more accurately represent the range of the bird. It extends west as far as the neighbourhood of Bushire. Whether it is found at the extreme north end of the Persian Gulf, or on the south-west coast of the Gulf in Arabia, I cannot say.

On the few occasions on which I saw this roller in Balúchistán, it was on date palms. It is of course non-migratory, the region which it inhabits being sufficiently warm to furnish a supply of insect food at all seasons.

[Non-migratory and found only in the palm groves on the coasts and in the neighbouring valleys. About Dálíkí and Khisht both species of roller are abundant in spring and summer, the European bird spending its winter in Arabia, while *C. Indica* remains at home. In these places I have shot a great many specimens in the hope of finding a hybrid, but without success.—O. St. J.]

Family CAPRIMULGIDÆ.

53. **Caprimulgus Europæus, L.**

1, 2 ♂.	Near Bam, South-eastern Persia	3000	April 20.
3 ♀.	Sarján, south-west of Karmán	5700	May 29.
4 ♀.	Oak forest near Shiráz	6000	June.
5 ♂.	Near Shiráz	7500	—
6 ♂.	Karij valley, N. of Tehrán, Elburz mountains	7000	Aug. 10.
7. ♀.	Karij valley	7000	Aug. 15.
? 8. young ♀.	Karij valley	7000	Aug. 10.

The specimens vary much in colour. Those from Northern Persia agree well with European birds, the others are rather paler, and the three skins from Bam and Sarján are greyer than the rest. One skin of a male from Bam differs so much from typical birds that for some time I thought it distinct; the prevailing colour above and below is dusky grey, but the specimen does not differ in its markings or dimensions from others.

A young bird from the Elburz is very pale coloured, but more rufous than the other specimens; there is a similar skin from Syria in the British Museum.

C. Europæus appears to extend throughout the Persian highlands, at all events in summer. I did not meet with it in Balúchistán, and it probably winters in Arabia.

[I once obtained a specimen of the common nightjar in the forest west of Shiráz, at an altitude of 7000 feet, but it is commoner about gardens and irrigated land, though nowhere very plentiful.—O. St. J.]

54. C. Ægyptius, Licht.

Verz. Doubl. p. 69.—Shelley, Birds of Egypt, p. 175, Pl. VIII.
C. isabellinus, Tem. Pl. Col. 379.

1 ♀. Bampúr, Balúchistán .. .. 2000 .. April 5.

This is, I believe, the first recorded occurrence of this species in Asia. The specimen does not differ from African skins. It measures wing 8.25, tail 5, tarsus 0.95.

55. C. Mahrattensis, Sykes.

P. Z. S. 1832, p. 83.—Gould, Birds of Asia, pt. ii.—Jerdon, B. I. i, p. 197.
C. Unwini, Hume, Ibis, 1871, p. 406.

1 ♀. Báhú Kalát, Balúchistán .. Near sea level .. Feb. 3.

The original type of this species, like the remainder of Col. Sykes's collection, is at present inaccessible, but my specimen agrees well with Gould's figure in the Birds of Asia and with specimens in the British Museum. It is, I think, clearly the same as Hume's *C. Unwini*, the only difference being that the lower tail coverts in my specimen, a female, are not barred, but uniform buff, as in the male.

The Balúchistán bird further agrees well with Jerdon's description of his specimen from Caragola, except that he places this bird in a group with the tarsus bare. I cannot help suspecting that in his specimen the nudity of the tarsus was accidental; certainly in the specimens assigned to *C. Mahrattensis*, which I have examined in England, the tarsus is half-feathered. I think it may have been this supposed want of feathers on the tarsus in *C. Mahrattensis* which caused Mr. Hume to redescribe what I suspect is the same species as *C. Unwini*.

The dimensions in the flesh of the specimen obtained were, length 9.5, expanse 21.75, wing 7.1, tail 4.5, tarsus 0.9, bill from gape 1.3, wings extending to within a quarter of an inch of the end of the tail. It was shot in a barren stony ravine on the side of a small hill, all the country around being very barren and desert.

56. C. sp.

1 ♀ (?). Near Shiráz 6000

I am unable to identify this with any known form, but I do not like to give a new name to a single female specimen in so difficult a genus as *Caprimulgus*. The following is a description of the skin :—

General colouration near that of *C. Ægyptius*, but rather paler and more rufous, the markings on the upper parts rather indistinct. Head above and back light greyish rufescent with very few black marks; some pale rufescent white patches on the wing coverts; quills brown with large rufous blotches forming imperfect transverse bands on both webs, not mottled on the first primaries except near the tip, but becoming more broken up on the last primaries; secondaries more or less mottled throughout, as are the tips of the primaries. Tail feathers pale rufous, the central rectrices washed with silvery grey, all irregularly spotted with brown, and with narrow flexuous and irregular brown transverse bands. Lower parts isabelline, throat and breast with narrow transverse brown bars and a white spot in the middle of the throat. Tarsi feathered in front about half way down. Wing 6.8, tail 4.5, tarsus 0.65.

This species differs from *C. Ægyptius* and *C. Mahrattensis* in colour and markings, but approaches the latter in size. It agrees fairly in general character with *C. inornatus*, Heugl. from the Abyssinian coast of the Red Sea; but it differs in size, being considerably larger, in being more fulvous, in having much broader and larger rufous bands on the internal webs of the primaries, and in being paler beneath. Still it may prove to be only a variety of the Abyssinian species, which appears to vary much in colouration, some specimens being very much darker than others.

[This little nightjar was shot in the willow jungle in the bed of the Kárá-agatch river.—O. St. J.]

FAMILY CYPSELIDÆ.

57. Cypselus apus, (L.)—De F.

1 ♂. Rígán, Narmashír, South-eastern Persia	2500 ..	April 18.
2 ♂. Shiráz	4750 ..	June.
3 ♀. Shiráz	4750 ..	—

Locally abundant on the Persian highlands in summer. I did not observe it in Balúchistáń before April the 2nd, when I noticed a few near Bampúr, but Hume saw it on the coast in February. The birds which breed on the highlands of Persia must go to Arabia and North-east Africa in the winter.

[The common swift breeds in immense numbers in particular localities. About the city of Shiráz it is especially abundant. Every fine evening, from the middle of April till the end of October, the air above the town is filled with swifts, crossing and recrossing in every direction, chasing the insects which, towards sunset, rise from the tanks of water which occupy the middle of every courtyard. Nowhere else have I seen birds in such numbers.—O. St. J.]

58. Cypselus melba, (L.)

1 ♂, 2 ♀. Near Shiráz	6000

I did not myself meet with the Alpine swift in Persia: the two specimens obtained having both been collected by Major St. John.

[Not very common. I have noticed it more frequently about the plain of Persepolis than elsewhere.—O. St. J.]

59. Cypselus affinis, Gray.

1, 2 ♂. Parpá, 150 miles east of Shiráz	7000	May 30.
3 ♀. Máyín, north of Shiráz	5500	June 24.

The common Indian swift was only observed on a very few occasions in Southern Persia; it was not seen by me either in Balúchistán or in Northern Persia. Hume, however, met with it on the Balúchistán coast.

Family UPUPIDÆ.

60. Upupa epops, L.—De F.

1 ♀. Kalagán, Balúchistán	3000	March 11.
2 ♂. Jálk, Balúchistán	3000	March 17.
3 ♂. Shiráz	4750	June.

Not very common.

Suborder PICI.

Family PICIDÆ.

61. Picus Syriacus, Hemp. and Ehr.—De F.

Symbol. Phys. Aves, fol. r (1828).—Sharpe and Dresser, Birds of Europe, pt. ix.
P. Feliciæ, Malh. Monogr. Pic. i, p. 127.
P. khan, De Filippi, Archiv. p. l. Zool. Genova, ii. p. 385; Viaggio in Persia, p. 350.—Salvadori, Atti Acad. Tor. 1868, iii, p. 287.

1 young ♀. Shiráz	5000	—
2, 3 ♂, 4, 5, 6 ♀. Oak forest, near Shiráz	4000–7000	June.

7 ♂. Isfahán	5000 ..	July 10.
8 ♂, 9, 10 young ♂, 11 young ♀. Kohrúd, north of Isfahán	7000 ..	July 18–22.
12 young ♀. Jájirúd valley, Elburz mountains	7000 ..	August 7.
13 young ♂. Karij valley, Elburz mountains	7000 ..	August 16.
14–17 ♀. Near Resht, Ghílán	— ..	November.

Sharpe and Dresser, in the 'Birds of Europe,' have shown that *P. Feliciæ* is the adult, and *P. khan* the young, of *P. Syriacus*, and I have since examined the types of the two latter species, at Berlin and Turin respectively, and confirmed this view. The identity of *P. khan* and *P. Syriacus* had been previously shown by Salvadori.

There is but little to be added to the description of this bird in the 'Birds of Europe.' Skins of adults from Persia usually have the interscapulary region more or less brown, instead of glossy black, and the amount of white on the outer tail feathers varies greatly. Usually there are on the outermost pair two imperfect bars, with, not unfrequently, an additional white spot above on the outer web, but the extent of the bars across the feathers varies, and in some specimens the white is almost confined to the spots on the outer web, sometimes united along the margin of the feathers. The quantity of white on the next pair is usually less; in some specimens it covers only the extreme tip, and forms a narrow fringe about half an inch long to the outer edge. As a rule, specimens from Southern Persia have less white on the rectrices; one fine male from Shiráz has none on the penultimate pair, and only two minute spots on the exterior web of the outer pair.

This woodpecker, the representative of *P. major* in Western Asia, appears to be found throughout the highlands of Persia. I did not notice it to the east of Karmán, but between Karmán and Shiráz I saw woodpeckers more than once, and I have little doubt but that they belonged to the present species. From Shiráz to Tehrán it was noticed almost wherever trees existed, mostly, of course, in gardens and orchards, outside of which trees are very rarely seen in this part of Persia. It was very common in the valleys of the Elburz north of Tehrán, and Major St. John obtained it in the forests near the Caspian.

[This is the common woodpecker of Persia, and found in all large gardens from Shiráz to Tehrán.—O. St. J.]

62. P. Sindianus, Gould.

P. Scindeanus, Gould; Horsf. and Moore, Cat. Mus. E. I. C. ii, p. 671.—Jerdon, Birds of India, i, p. 273.—Hume, Ibis, 1870, p. 529.—Jerdon, Ibis, 1872, p. 7.—Hume, Stray Feathers, i, p. 170; Lahore to Yarkand, Pl. II.

1, 2 ♂.	Báhú Kalát, Balúchistán	—	Feb. 1, 2.
3 ♀.	Aptar, east of Bampúr, Balúchistán	3000	March 21.
4 ♀.	West of Bampúr	1800	April 8.

In the original description of this species, it was said to resemble *P. medius*, L., and this was quoted by Jerdon (who had not at the time seen the species) in the 'Birds of India.' He then placed it amongst the *Pici* with plumage banded above, a classification corrected subsequently (Ibis, 1872, p. 7). Mr. Hume has correctly identified and figured the species. The specimens in the British Museum were received from the collection of the East India Company, and were probably some of the types collected by Dr. Gould. I have compared my specimens with them.

This species is really allied to *P. major* and *P. Syriacus* rather than to *P. medius*, but it is distinguished from them by having the whole crown of the head red in the male. The female is very much like the same sex in *P. Syriacus*, but distinguished by having much more white on the outer tail feathers, by the white spots on the quills being smaller, and the dimensions altogether less.

The following is a description of *P. Sindianus*:—

Male: forehead, lores, and sides of head and neck, including the supercilia and ear coverts, white, more or less stained, on the forehead especially, with buff; a narrow black line above the supercilia; crown mixed red and black, the feathers being crimson at the end, followed by a narrow black bar, and dusky at the base; a black band runs from the lower mandible down each side of the throat, and joins the back above the shoulder; from this band a rather short stripe projects on to the side of the breast. Back and rump glossy black, often with a brownish tinge, scapularies and the adjacent wing coverts white, remainder of wing coverts black, usually with a few white spots, quills brownish black with white spots on both webs, forming white wing bars, of which there are four on the primaries and three on the secondaries beyond the ends of the coverts, including one band just along the terminations of the greater coverts. Tail black, the two outer pairs of rectrices tipped with white, and banded near the end; there being generally one white band right across the feather, and a second higher up and more or less imperfect; the last band on the penultimate pair of rectrices is only represented by a white spot on the outer web. Usually there is a little white about the end of the third pair of feathers from the outside. Lower parts white, with a few faint dusky longitudinal streaks on the abdomen and flanks, middle of abdomen and lower tail coverts crimson. Iris dull crimson; bill blackish above, bluish grey below; legs dusky olive. Dimensions in the flesh: length 8.5 to 8.75 in., expanse 15.3 to 15.5, wing 4.9 to 5, tail 3, culmen 1.25, tarsus 0.9, length of foot 1.8, closed wing short of end of tail 1 to 1.4.

Females have the crown black like the back, and no crescentic black band on the sides of the breast. They are also rather smaller; wing 4.6, tail 2.75.

I found this bird on tamarisk trees in the few places in Balúchistán in which tree jungle was met with, up to an elevation of about 3000 feet above the sea.

63. P. Sancti Johannis, W. Blanford, Pl. IX.

Ibis, 1873, p. 226.

1, 2 ♂ (?), 3 ♀. Oak forest, near Shiráz .. 4000-7000 .. June.

P. *affinis* P. medio, *sed pileo minus roseo, pectore albo, haud fulvo; abdomine medio flavo, crisso subcaudalibusque solis coccineis; pectoris lateribus abdomineque striis nigris angustioribus signatis; rectricibus extimis fasciá unicá albá mediocri transversá, nec duabus latis notatis, penultimis extus albo maculatis, haud fasciatis, reliquis omnino nigris; remigibus e contrario maculis albis majoribus signatis. Long. alæ* 4.75, *caudæ* 2.75, *tarsi* 0.8, *culminis* 1.1, *poll.*

Hab. in quercetis prope urbem Shiráz in Persiá meridionali.

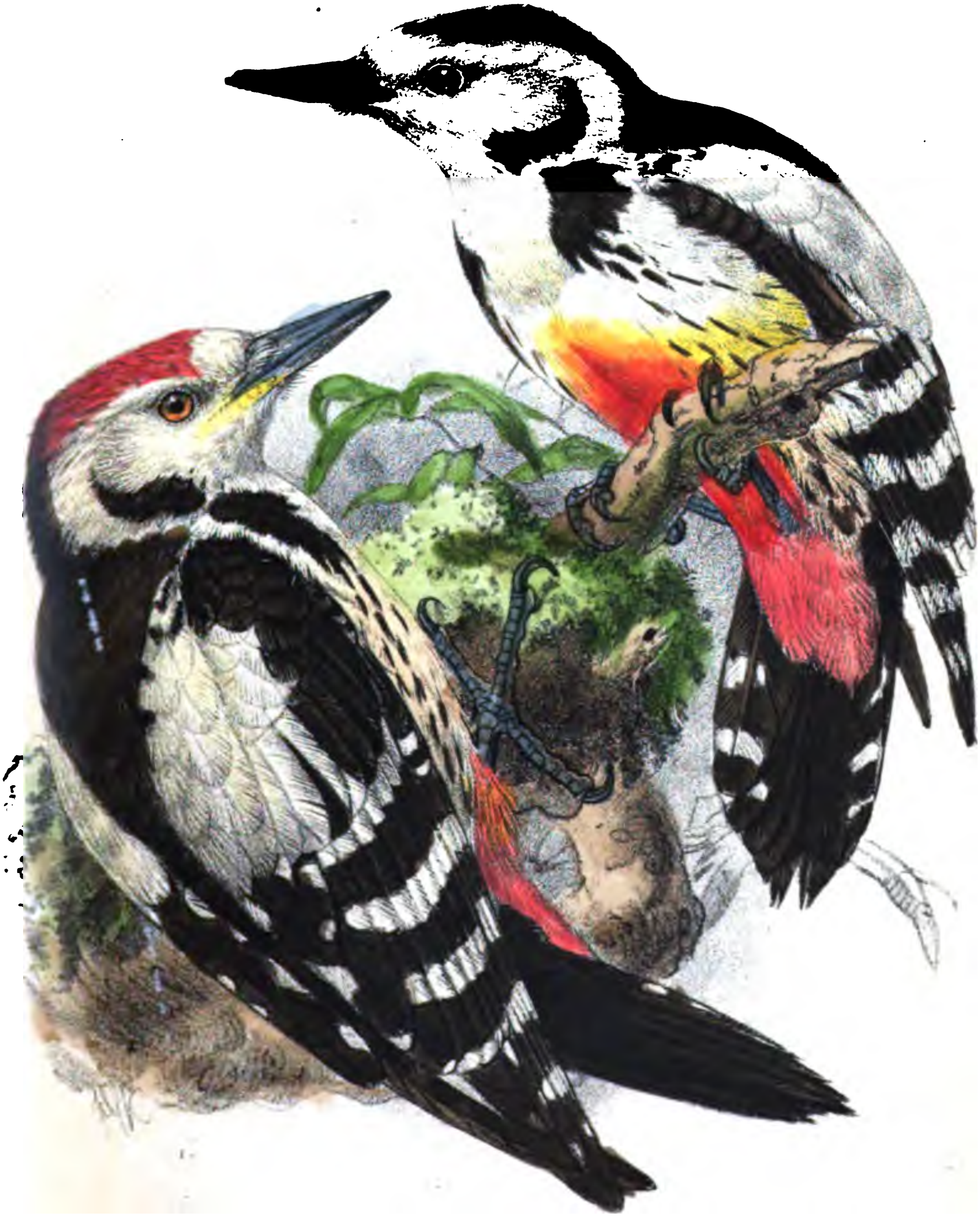
Crown of the head scarlet, less crimson than in *P. medius*, forehead, lores, and sides of the head white, with a slight isabelline tinge, which is more pronounced on the forehead; ear coverts greyish with a greyish white band passing from behind them to the sides of the breast. In front of this grey region is a sooty black band, rather irregular in form, terminating in an imperfect pectoral gorget. Nape and hind neck brownish black, back brown, rump and upper tail coverts brownish black. Tail dull black, without any white on the six central feathers, the penultimate pair with two white spots on the outer, and one on the inner web, the latter corresponding with one of the former, but not united with it as in *P. medius:* perhaps in fresh moult these feathers may have a white tip, of which, however, no trace remains in the specimens collected. The outermost rectrices have a white tip, a rather irregular white bar about half an inch from the end, much narrower than the black band beyond it, and one or two more white spots on one or both webs nearer their base. Scapulars white; wing coverts brownish black, some of those next the scapulars edged and tipped with white; quills brownish black, with white spots on both margins, those on the outer primaries being about as long as the intervening black spaces; altogether these spots form six bands on the primaries and four on the secondaries, the band at the base being partly concealed by the coverts. These bands are conspicuously broader than in *P. medius*. Breast dull white, with imperfect black gorget; sides of the breast and flanks, which are greyish, and the abdomen with narrow long dark streaks; middle of abdomen yellow; lower abdomen, vent, and under tail coverts scarlet.

It is probable that specimens in fresher plumage would have the upper parts darker, and the back blackish brown, as in *P. medius*. The three specimens examined, though in good condition, have the plumage much worn.

This is a close ally of *P. medius*, chiefly distinguished by smaller size, by the breast being white, not yellow, and the red of the abdomen confined to the posterior portion, by the stripes on the lower surface being less marked, and by there being much less white on the outer tail feathers, and more on the quills. The following are the dimensions of the three specimens, and of a male of *P. medius* from Asia Minor for comparison:—

	Wing.	Tail.	Tarsus.	Culmen.
P. Sancti Johannis, ? male	4.73	2.6	0.82	1.1
P. Sancti Johannis, ? male	4.65	2.65	—	1.13
P. Sancti Johannis, female	4.7	2 86	0.8	1
P. medius, male	4.9	3.2	0.9	1.2

[This new woodpecker, which Mr. Blanford has been good enough to name after me, is found in the wooded hills of South-western Persia, at altitudes of from 4000 to 8000 feet. It is particularly numerous in the oak forests. I am not quite sure whether the woodpecker found in the jungly beds of the Bandámír and other streams is *P. Syriacus*, but *P. Sancti Johannis* certainly does not extend into Central Persia, though it will probably be obtained in the forests which clothe the outer slopes of the Zagros hills as far as the Karmansháh and Bághdád



Keulemans del. Mintern Imp.

PICUS SANCTI JOHANNIS

road, if not further north. It was one of the first birds I obtained in Persia, and I always thought it would prove a novelty.—O. St. J.]

64. Gecinus viridis, (L.)

Picus. Karelini, Brandt, Bull. Acad. Sci. St. Pet. ix, p. 12, 1842.—Malherbe, Mon. Pic. ii, p. 126.

1 ♀. Oak forest, near Shiráz .. .. .. 7000 .. June.

As *P. Karelini*, according to Malherbe, has been identified by Brandt himself with *G. viridis*, we must refer it to that species. The description gives one the idea of a distinct race, the lores being said to be whitish, with a white band under the eye. This region is only spotted white in the young of *G. viridis*. The type of *P. Karelini* was from near Astrabád.

The single female specimen in our collection was shot in June, by the collector who accompanied Major St. John, in the oak forest near Shiráz. In all its proportions, in the distribution of the colours, and in the markings on the quills and tail feathers, it precisely resembles *G. viridis*, but all its colours are paler and greyer, there being scarcely any green on the back, and none on the lower parts, except a slight tinge on the lower abdomen. The back is brownish grey, more or less washed with green, the rump pale lemon yellow, the tail feathers greyish brown with whitish bars, the quills dusky brown, ear coverts, sides of the neck and underparts to the abdomen dirty white. The specimen is scarcely mature, for it has cross bands on the abdomen, and is probably a bird of the preceding year; the plumage is worn, and the fresh feathers would doubtless be much greener. I was much disposed to consider this bird distinct from *G. viridis*, of which I have never seen a specimen with the same colouration, but it appears on the whole most probable that the skin is that of a nesting female in very old abraded plumage, and perhaps rather dull-coloured and pale, as so many Persian birds are. Its discovery in Southern Persia extends the range of the species considerably.

[In 1864 I shot a young green woodpecker in the oak forest, the only one I have ever seen in Southern Persia. I considered it to be *G. viridis*. In 1869 my collector procured an adult specimen in the same place. It is probably a rare straggler from the forests of the Zagros hills.—O. St. J.]

65. * G. canus, (Gm.)

Found by Ménétries near Lankorán.

Picus minor, L. and *Picoides tridactylus*, (L.) are found in the Caucasus, and are said by Eichwald to extend, with *Gecinus canus* and *G. viridis*, into Persia, but I do not like to include them in the fauna without further evidence, though their existence in Ghilán and Mazandarán is highly probable. *Dryocopus martius*, (L.) is found in several parts of Central and Northern Asia, and its probable existence on the Kelat frontier of Sind has lately been indicated by Hume (Stray Feathers, i, p. 171). No specimen has, however, been obtained.

In the lists of the older zoological writers is included a species of woodpecker called *Picus luteus Persicus* by Brisson, *Picus Persicus* by Gmelin, the Persian woodpecker by Latham, etc. All these names are founded on a description and figure by Aldrovandi (Ornithologia, p. 850) of a bird called by him *Picus luteus cyanopos Persicus*, and this description and figure again were not taken from a specimen, but from a drawing which Aldrovandi saw at Venice of a woodpecker with a ferruginous bill and bluish feet, said to have been made from a Persian bird. It is simply absurd to attempt to identify a species concocted out of such ridiculous data.

Yunx torquilla, L., must, in all probability, exist in the Caspian and Zagros forests, but it has not hitherto, so far as I am aware, been recorded from within our limits.

SUBORDER PASSERES.

FAMILY LANIIDÆ.

66. Lanius lahtora (Sykes).

? *L. Aucheri*, Puch. Mus. Par. apud Bp. Rev. et Mag. Zool. 1853, v, p. 294.

1 ♂. Gwádar, Balúchistán coast	— ..	December.
2 ♂. Dasht River, near Gwatar Bay, Balúchistán	— ..	Jan. 25.
3 ♀. Báhú Kalát, Balúchistán	— ..	Feb. 3.
4 ♂. Mand, Balúchistán	500 ..	Feb. 12.
5 ♀. Bam, South-eastern Persia	3600 ..	April 24.

Although this bird was common in Balúchistán in the winter, and I met with it at Bam close to the Persian highlands, I never obtained it on the plateau, nor is there a single example among Major St. John's collections. Sharpe and Dresser in the 'Birds of Europe' say that De Filippi obtained it in Persia, but the only grey shrike mentioned in the list of birds obtained by that ornithologist (Viaggio in Persia, p. 346) is *L. minor*, the species obtained by both Major St. John and myself. It is probable that the specimen referred to by Messrs. Sharpe and Dresser is one procured by the Marquis Giacomo Doria at Bandar Abbás, and now in the Museo Civico at Genoa. This I have examined, and it appears to me to belong unquestionably to *L. lahtora*.

A specimen of *L. excubitor* is said to exist in the Indian Museum of London, brought by Captain Jones from Mesopotamia (Moore and Horsf. Catalogue, i, p. 162). Unfortunately the specimens in this Museum are at present inaccessible, but if the identification is correct, it is probable that the great grey shrike of Europe must be added to the Persian fauna.

The type of *L. Aucheri*, Puch. was brought by Aucher-Eloy from Persia in 1840; the exact locality is not stated, nor is it clear from the brief description whether the bird belongs to *L. lahtora* or *L. excubitor*, though the former is most probable. The only constant character, as pointed out to me by Mr. Dresser, by which these two species can be distinguished, is the greater length and thickness of the tarsus in the former.

67. L. minor, Gm.—De F.

1, 2, 3, 4 ♂, 5 ♀, 6 young ♂, 7, 8, 9 young ♀.	Shiráz	4750	..	June.
7, 10 young.	Near Kazvín, North Persia.. ..	4000	..	August.

I found this bird abundant between Tehrán and Kazvín at the end of August, but I did not notice it anywhere else during my journey, whilst all Major St. John's specimens are from Shiráz. It evidently breeds in the latter locality and doubtless in Northern Persia also, but I do not think it is generally distributed in Persia in the summer, and it probably leaves the country altogether in the winter months. Like many shrikes and other insectivorous birds, it has a habit of perching on telegraph wires, and I ought to have seen it frequently had it been at all common in the country between Shiráz and Tehrán in June and July.

68. * L. collurio, L.—De F.

I did not myself meet with this shrike, nor is there a specimen in

Major St. John's collection. De Filippi says of it and of the two other shrikes mentioned by him, 'Met with everywhere, but more common in the Caucasian regions.' There are three specimens collected by De Filippi in the Turin Museum, one of which is from Ghílán, the others are only labelled Persia. Ménétries found it common at Lankorán on the Caspian. It occurs probably only in North-eastern Persia.

69. **L. auriculatus**, Müll.—De F.

L. rufus, Bris. Pl. Enl. f. 2.—De Filippi, Viag. in Persia, p. 46.
L. rutilus, Lath. Ind. Ornith. i, p. 70.
L. senator, L. apud Gray, Handlist, i, p. 393, nec L.

1 ♂. Niríz, east of Shiráz	7000	June 1.
2 ♂. Niríz, east of Shiráz	6000	June 2.
3, 4 (nestlings). Near Niríz, east of Shiráz	5000	June 5.
5 ♂, 6, 7, 8 young ♂. Shiráz	4750	June.
9 ♂, 10, 11 young ♀. Shiráz	4750	July.
12 ♂. Shiráz	4750	August.

All the specimens obtained were killed in the neighbourhood of Shiráz, where this bird evidently breeds in April or early in May; the young birds shot early in June could not have left the nest many days, for they retain the barred plumage represented in Sharpe and Dresser's figure in the 'Birds of Europe.' They are, however, greyer and less fulvous than the breed from Holland there represented, and the bars have already been worn off the abdomen and are faint on the breast. In two young birds, shot also in June at Shiráz, the transverse markings have disappeared entirely from the lower parts, and the head above is beginning to assume a rufous tinge; in two others, killed in July, all the bars had disappeared from the back, but one is still faintly, the other distinctly banded on the head.

The occurrence of this bird in Southern Persia considerably extends its known range; Sharpe and Dresser, when they wrote the description of the species in the 'Birds of Europe,' did not know of its occurrence east of the provinces around the Black Sea. It was found in Northern Persia by De Filippi, and its absence in Central Persia is doubtless due to the paucity of cover.

70. **L. vittatus**, Valenc.

Valenc., Dict. Sc. Nat. 1826, xl, p. 227.—Walden, Ibis, 1867, p. 220.
Collurio Hardwickii, Vig. P. Z. S. 1831, p. 42.
Lanius Hardwickii, Jerdon, Birds of India, i, p. 405

1, 2 ♂. Near Kalagán, North Balúchistán ..	5000	..	March 20.
3 ♂, 4 ♀. Sib, near Dizak, North Balúchistán	4000	..	March 26.
5, 6 ♂. Ispidán, east of Bampúr, Balúchistán	4000	..	March 30.
7 ♀. Near Aptar, east of Bampúr, Balúchistán	4000	..	March 31.
8 ♂. Bampúr, Balúchistán	2000	..	April 5.
9 ♀. West of Bampúr, Balúchistán	1600	..	April 10.
10 ♀. 100 miles west-north-west of Bampúr ..	2500	..	April 14.

I never saw this bird, the common bay-backed shrike of India, in the country traversed between the coast of Balúchistán and Jálk on the edge of the Sístán desert, and consequently when, on turning westward, I found it abundantly in the valleys between Dizak and Bampúr, and in the wooded plain near the last-named town, I thought it must be a distinct species, for several places on the road from Gwádar to Jálk are as liberally supplied with trees and bushes as the Bampúr country, and consequently, to all appearance, equally well suited for this bird. After carefully comparing my specimens, however, with Indian skins, I can see no difference, although the measurements do not precisely agree with Jerdon's, the wing and tarsus being longer, and the tail rather shorter. The measurements of 1 and 2 were from fresh specimens, 3 and 4 from skins.

	1 ♂. Near Kalagán. In.	2 ♂. Near Aptar. In.	3 ♀. Sib. In.	4 ♀. W. of Bampúr. In.
Length	7.8	7.75	—	—
Expanse	11	10.3	—	—
Wing	3.6	3.5	3.35	3.5
Tail, from insertion of central tail feathers	3.7	3.6	3.6	3.45
Tarsus	0.95	0.95	0.9	0.95
Mid toe and claw	—	0.7	—	—
Bill from forehead	0.55	0.52	0.55	0.55
Bill from gape	—	0.77	—	—
Wings, short of the end of the tail ..	2.4	2.4	—	—

L. vittatus was especially abundant about Bampúr. I never met with it on the Persian highlands, nor did I see it, so far as I remember, in Narmashír, east of Bam. It is thus, evidently, like *Athene Brama* and *Butastur teesa,* one of the Indian forms which extend into Balúchistán, but not into Persia proper.

71. L. isabellinus, Hemp. and Ehr.

H. and E. Symbol. Phys. 1828, Aves, fol. e.—Strickland, P. Z. S. 1850, p. 217.—Walden, Ibis, 1867, p. 224, Pl. V, fig. 1.

L. arenarius, Blyth, J. A. S. B. 1846, xv, p. 304.—Jerdon, Birds of India, i, p. 407; Ibis, 1872, p. 115.—Walden, Ibis, 1867, p. 223.—Henderson and Hume, Lahore to Yarkund, p. 183, Pl. III.—Hume, Stray Feathers, i, p. 174.

1 ♂, 2 ♀. 100 miles W.N.W. of Bampúr, Balúchistán	2500	April 14.
3 ♀. Rígán, Narmashír	2500	April 18.
4 ♂. Near Bam, South-eastern Persia	3500	April 24.
5 ♂. Khán-i-súrkh, south-west of Karmán	8500	May 22.
6 ♂. Near Parpá, 150 miles east of Shiráz	6000	May 30.
7 ♀. Kázrún, 50 miles west of Shiráz	2500	May.
8, 9, 10, 11 ♂, 12 ♀ (all young). Shiráz	4750	June.
13 ♂, 14 young ♂. Shiráz	4750	July.
15 young. Near Asupás, north of Shiráz	7000	June 25.

I am quite of Mr. Hume's opinion (l. c.) as to the identity of *L. isabellinus*, H. and E. and *L. arenarius*, Blyth, and I have suspected that they were the same ever since I compared the specimens of the former which I collected in Abyssinia, but I have not had until lately an opportunity of examining a sufficient series of skins to enable me to judge of the value to be attributed to the distinctions between the two forms. By the kindness of Lord Walden and Mr. Dresser I have had for comparison a very good series of these shrikes, viz. four skins from the Panjáb and six from Central Asia (Turkestán), and after comparing these with the specimens obtained from Persia and those procured by me formerly on the Abyssinian coasts of the Red Sea, and now in the British Museum, I am fully convinced that *L. arenarius* is only the female or young of *L. isabellinus* in winter dress.

This quite agrees with the opinion arrived at by Mr. Hume, who in 'Stray Feathers' has shown that the differences, chiefly the presence or absence of a small white alar bar, on account of which various ornithologists have separated these two supposed species, depend upon age and sex. I cannot quite agree, however, with Mr. Hume's opinion, that only the perfectly adult male exhibits the white wing-spot, for, amongst the specimens collected by myself, one barely adult female, No. 3, has it very well developed, although the eye-streak is hair brown, and there are other traces of immaturity about the plumage; and on the other hand, one male in full plumage, No. 5, has not a trace of white on the quills beyond the ends of the coverts. As a general rule, I believe that the presence of a well-marked white band at the base of the primaries is characteristic of full-grown males, but every gradation may be found, from the well-marked band to total want of white near the bases of the primary quills. The latter, however, amongst the series before me, is only seen in young birds; in all adult birds, males or females, there is a trace of a white band below the greater wing coverts.

The white band is not, however, the only difference which at first appears to distinguish *L. isabellinus* from *L. arenarius*. Adult specimens of the former have the upper part of the head and back of the neck bright rufous, and all the lower parts pure white. In the latter, as usually found in India, the whole upper parts as far as the rump are uniform earthy brown, and the lower parts are a pale brownish rufous. The latter character is, I think, chiefly seasonal, and is perhaps more developed in birds of the year. Birds from India are certainly very brown beneath, but I have but few other winter specimens for comparison, and one of these, a female in the British Museum, shot by myself in January at Annesley Bay on the Abyssinian shores of the Red Sea, is exactly the counterpart of a Panjáb specimen, killed in December, in Lord Walden's collection, both birds being earthy rufous on the under parts. An adult male, shot by Major St. John at Shiráz in July, has a decidedly rufous tinge beneath, and is not nearly so white as birds shot in the spring. There is certainly one specimen from Central Asia in Lord Walden's collection, shot on the 5th of March, with the under parts isabelline; but this, if correctly marked as a male, is probably a bird of the year, for the lores are white; and although it differs much in plumage from the ordinary breeding dress of *L. isabellinus*, it also differs considerably from the winter plumage of *L. arenarius*, the colour of the lower parts being intermediate.

The uniformly brown back and head are not always peculiar to the winter season, for both male and female specimens from Central Asia, shot in March and April, in Lord Walden's and Mr. Dresser's collections, exhibit this character just as much as those killed in winter in the Panjáb and Sind; but others from Turkestán have rufous heads, and differ in no way from Persian birds, and in this character, as in the brownish under-parts and the wing-spot, there is a perfect graduation between the two extremes. Moreover the different characters are irregularly combined; thus the most strongly-marked wing-spot I have seen, one extending nearly half an inch below the wing coverts, is in a male specimen belonging to Mr. Dresser, shot on the 16th of April in Turkestán, yet this bird has the whole upper parts as far down as the rump not only uniformly coloured, but greyer and less rufous than in any other skin I have examined.

There is considerable variation in the brightness of the rufous head, and some specimens have the back much greyer than others. Females appear to be less rufous and more uniformly coloured than males, and probably the bright rufous head is only assumed in breeding plumage. All adult males shot in the spring, i. e. the breeding season, have the eye-streak quite black, and a narrow white superciliary stripe above it, whereas in all females the lores are white, and the streak, even behind the eye, brownish. The figure in the Ibis (l. c.) is darker and more rufous on the back than are any of mine. (Hume makes a similar remark.)

Young birds are dull rufous brown above, the tail being slightly, and the upper tail coverts considerably, brighter than the remainder of the upper plumage, which is uniform when the bars characteristic of the nestling stage have disappeared. There are of course broad fulvous edgings to the secondaries and wing coverts. The lower plumage is rufous white with dusky crescentic marks. There is in some cases a pale margin to the tips of the rectrices with a well-marked dusky line inside it, and it may be the remains of this which formed the obscure dark transverse band mentioned by Strickland as occurring in a Kordofan specimen[1].

The examination of the large series of skins of *L. isabellinus* confirms the importance of the character pointed out by Lord Walden as distinguishing this species from *L. cristatus*, L. (of which *L. phœnicurus*, Pall. appears to be a synonym). In the former the rectrices are broader and less graduated, the difference in length between the outer and central tail feathers not exceeding half an inch. In *L. cristatus* the tail feathers are much narrower, and the central exceed the outer pair by from three-quarters of an inch to an inch. The extent and intensity of the rufous colouration both above and below, and the breadth of white on the supercilia, vary in both species.

It is, I think, pretty clear that the rufous-tailed shrikes furnish one of the numerous instances amongst migratory birds in which races ranging far to the east and west meet in India; but it is worthy of note that the line of division between the ranges of the two forms in the Indian peninsula is farther to the west in this case than in many others.

[1] The statement in the Ibis, 1867, p. 224, referred to by Mr. Hume, that in *L. arenarius* 'the centre pair of rectrices, at about one-third of their length from the end, display a well-marked irregular light-coloured transverse band,' is, Lord Walden informs me, rendered obscure by a misprint; it should read 'display well-marked irregular light-coloured bands.'

I did not see this bird in Balúchistán in the winter, which is curious, because it abounds in Sind at that season. The first time that I met with it was north-west of Bampúr, and thence it was seen frequently to beyond Shiráz, but I did not observe it in Northern Persia, and it is not recorded in De Filippi's list. It certainly breeds on the Southern Persian highlands, and I have no doubt but that the pair which I shot on the 14th of April had a nest close by, although I could not succeed in discovering it. The altitudes at which some birds were killed show that *L. isabellinus* ranges to a considerable elevation. Its habits present no peculiarity; it is found in thinly-wooded districts, and, like its relatives, sits conspicuously on the tops of bushes and on prominent twigs, whence it pounces down on insects.

FAMILY MUSCICAPIDÆ.

72. Muscicapa grisola, L.—De F.

1 ♀. Near Rígán, Narmashír, South-eastern Persia	3000 ..	April 16.
2, 3 ♂, 4 ♀, 5 (?). Shiráz	4750 ..	July.
6, 7 ♂. Isfahán..	5000 ..	July 10.
8, 9 ♂. Kohrúd, north of Isfahán	7000 ..	July 22.
10 ♂. Karij valley, Elburz mountains	6500 ..	Aug. 10.

A common bird throughout the Persian highlands, extremely abundant in places, and generally found wherever there is much vegetation.

73. M. atricapilla, L.—De F.

M. luctuosa, Tem. and De F.

1 ♂, 2, 3 ♀ (all immature). Karij valley, Elburz mountains	6500–7000 ..	Aug. 9, 10.

This flycatcher abounded in the valleys of the Elburz, but I never saw it in Southern Persia.

74. * M. collaris, Bechst.—De F.

M. Albicollis, Tem. and De F.

De Filippi obtained this species in gardens at Tabriz. I did not observe it.

75. **Erythrosterna parva,** (Bechst.)—De F.

1 ♂. Dizak, Balúchistán	4000	March 22.
2 ♂. Shápúr, between Shiráz and Bushire	2500	January.

This appears to be by no means a common bird in Southern Persia and Balúchistán, though, according to De Filippi, Doria found it abundant in spring in the neighbourhood of Tehrán. The specimen shot in January is in full plumage, with the whole breast red, flanks and under tail coverts pale rufous, thus confirming what I have noticed in the Central Provinces of India, that in this species the old males retain the red on their breasts in winter. The bird shot in March is young and only beginning to acquire the red throat and breast.

FAMILY TURDIDÆ.

76. **Pratincola caprata,** (L.)

1 ♀. Dizak, Balúchistán	4000	March 22.
2 ♂. Sibb, near Dizak	4000	March 27.
3 ♂, 4 ♀. Bampúr, Balúchistán	2000	April 7.
5 ♂. Bam	3500	April 22.
6, 7 ♂. Near Bam	3500	April 24.

I was much surprised at meeting with this chat in Balúchistán, for, as is well known, its range extends east and south-east of India into the Malay countries, and even to the Philippines, while it is a rare exception for an Indian form to extend both east and west of India proper. *P. caprata* was not observed near the coast in Makrán, but the bird is far from rare about Dizak, Bampúr, and Bam, keeping, of course, to those portions of the country in which trees and bushes are common, and being often seen in the gardens and orchards around towns and villages. It does not appear to ascend to the Persian highlands. I did not meet with it after leaving Bam.

I can see no constant difference between the skins obtained in Balúchistán, and others from India, the Malay countries and the Philippines. In the males collected by me there appears to be rather more white on the abdomen than in some Indian skins, but other Indian specimens precisely resemble mine. Hume (Stray Feathers, i, p. 182) points out that Sind birds run a trifle larger than those found in Upper India, and Balúchistán specimens rather exceed those from Sind in dimensions, thus tending still further to unite *P. caprata* with the larger race *P. bicolor*, Sykes, of the South Indian and Ceylonese hill regions. The following measurements illustrate these differences:—

	♂ Bam.	♂ Bam.	♂ Bampúr.	♀ Dizak.	♂ Sind (Hume).	♂ Upper India (Hume).
Length	5.5	5.75	—	—	5.	4.83 to 5.3
Expanse	9.	9.5	—	—	8.5	7.88 to 8.5
Wing	2.92	3.1	2.9	2.9	2.8	2.4 to 2.75
Tail	2.1	2.2	2.	2.07	—	—
Tarsus	0.87	0.9	0.86	0.85	—	—
Bill, from gape	0.7	0.7	—	—	—	—
Bill, from forehead	0.48	0.47	0.43	0.52	—	—
Wings, short of end of tail ..	1.	1.2	—	—	—	—

I do not give Hume's measurements of the tail, because he measures from the vent instead of from the insertion of the middle tail feathers, as is usual amongst ornithologists. Jerdon's measurements (Birds of India, ii, p. 123) are—length 5 in., wing 2.75, tail 2.2, bill at front .37, tarsus .87.

77. **P. rubicola,** (L.)—De F.

1 (young). Asupás, between Shiráz and Isfahán .. 7000 .. June 26.

I saw stone-chats occasionally in Balúchistán in the winter, but they were scarce, and I found them yet scarcer on the Persian highlands in spring and summer. The greater number probably go farther north to breed, and the only place where I found them common was in the great marsh near Asupás on the high plateau north of Shiráz. Here they had evidently bred, for I saw young birds, one of which I shot.

78. * **P. Hemprichi,** (Ehr.)—De F.

This chat also was obtained by De Filippi, but escaped my notice. He met with it at Marend, north-west, and Udián, south-west of Tabriz, and mentions that he saw specimens at St. Petersburg, collected in the Kirghiz Steppes. In India it is represented by *P. leucura*, Blyth.

Two Persian skins obtained by De Filippi are in the Turin Museum. In both the greater portion of the outer tail feathers is white, but the length of the black tip differs in the two specimens.

According to Radde (Reis. im Sud. O. Sib. ii, p. 247) *P. Hempricki* is also found in Dauria and Amurland, but he states that his specimens pass into *P. rubicola*, and from the account given it appears a little doubtful whether the birds really belong to *P. Hempricki*, as some of them are said to have the base of the tail feathers black. An examination of the fine series of types collected by Hemprich and Ehrenberg in Arabia, Abyssinia, India, and Egypt, and preserved in the Berlin Museum, shows, however, that the amount of white at the base of the tail feathers is very variable, and there appears almost a complete gradation from birds with the greater portion of the rectrices white into those with black rectrices as in *P. rubicola*.

On the whole, I am much disposed to doubt whether this form is more than a variety of *P. rubicola*.

79. * P. rubetra, (L.)—De F.

Parus variegatus, S. G. Gmel. Reise, iii, p. 105, Pl. XX, f. 3.

I did not notice the whin-chat. De Filippi obtained it in the valley of the Lár, north-east of Tehrán, in the Elburz mountains. It has been found in the Panjáb (Hume, Ibis, 1869, p. 355).

80. Saxicola œnanthe[1], (L.)—De F.

1 young. 150 miles east of Shiráz	7500	May 30.
2 young ♀. Shiráz	4750	June.
3 ♂, 4 ♀. Shiráz	4750	Summer.
5 ♀, 6, 7 young ♀. Shiráz	4750	September.
8 ♂. Shiráz	4750	November.
9 ♂. Elburz mountains, north of Tehrán	9000	August 11.
10 ♀. Elburz mountains, north of Tehrán	8000	August 14.
11 ♂. Elburz mountains, north of Tehrán	8500	August 14.

The genus *Saxicola* is well represented in Persia, and no less than twelve species are represented in Major St. John's and my collections. From such cursory observations as ours it is difficult to speak positively as to the distribution of the different kinds, although many appear restricted to well-defined limits. Generally speaking, the commonest form is *S. isabellina*, *S. deserti* is perhaps more abundant in the south, and in the Elburz it is entirely replaced by *S. œnanthe*. So far as my observations extended, I should say that the genus is far more abundant in Southern than in Northern Persia, many species breeding in the former and not extending their range to the north.

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[1] For the synonymy of this and other species of *Saxicola*, see a paper by Mr. Dresser and myself, P. Z. S. 1874, pp. 213-241.

The wheatear is said by De Filippi to be the most generally distributed of the whole class (of birds?) in all the steppes of Persia. This may be correct in the North-western portion of the country, but it does not accord with my experience in Central and Southern Persia. I only met with the species near Shiráz and again in the mountains north of Tehrán, and I doubt if, as a general rule, it breeds in the plains of Persia.

Since the Indian specimens attributed to this species by Blyth and Jerdon[1] have been shown by Hume (Ibis, 1869, p. 357, and 1870, pp. 143, 288) to have belonged probably to *S. isabellina*, Persia must be the Eastern limit of this species. The circumstances that I never observed it in South-eastern Persia or Balúchistán, and that Hume did not meet with it in Sind, are in favour of its range being restricted.

81. S. isabellina, Rüpp.

Rüpp, Atlas, p. 52, Pl. XXXIV, fig. 2.
S. saltator, Mén. Cat. Rais. p. 30.
S. œnanthe, Jerdon, Birds of India, ii, p. 132, nec Linn.

1, 2 ♀. Gwádar, Balúchistán	—	December.
3 ♀. Fáhráj, east of Bampúr, Balúchistán	2000	April 1.
4 ♀. Near Bam, South-eastern Persia	3500	April 20.
5 ♂, 6 ♀, 7 young ♀. Shiráz	4750	June.
8 ♂. Near Shiráz	—	September.

On the whole this is probably the commonest Persian chat, but it becomes rarer towards the north. In Southern Persia and Balúchistán it was found nearly everywhere, though rarely very abundant in any locality, and it breeds apparently throughout the southern portion of the Persian plateau. It is equally at home in the midst of the desert and on the mud walls around gardens and fields in the suburbs of towns, and may when seen be distinguished at a glance from its various allies, the females of which it closely resembles in plumage, by its superior size. In this bird not only are the sexes alike, but there is very little difference between the summer and winter plumage; the colouration is a little purer in the spring, but the change is very trifling.

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[1] Also by Beavan, Ibis, 1867, p. 450. The length of the tarsus shows that his birds thus named belonged to *S. isabellina*.

The two birds for which *S. isabellina* is constantly mistaken are the female of *S. deserti* and that of *S. œnanthe*. From the former it may immediately be distinguished by the much smaller amount of black at the end of the lateral tail feathers, the length of the black tip in *isabellina* being ½ to ¾ in., in *deserti* 1¼ to 1½ in. *S. isabellina* too is a much larger bird, with a larger bill and longer tarsus. In adults of *S. œnanthe* the under wing coverts are black and white mixed (as mentioned by Mr. Brooks, Ibis, 1870, p. 288), in *S. isabellina* they are pure white. The young birds of *deserti*, like the adults, may easily be distinguished from *S. œnanthe* by the amount of black on the outer tail feathers, those of *isabellina* are more difficult to recognise, and the only trustworthy tests are, I believe, the longer and thicker tarsus in *isabellina*, and the paler colour of the primaries.

82. **S. deserti**, Rüpp.—De F.

1 ♂. Pasní, Makrán coast, Balúchistán	—	Nov. 29.
2, 3, 4, 5, 6 ♂, 7 ♀. Gwádar, Balúchistán	—	December.
8 ♂. Gwádar, Balúchistán	—	Jan. 16.
9 ♂. Gwádar, Balúchistán	—	Jan. 24.
10 ♂. Dasht river, Balúchistán	—	Jan. 24.
11 ♀. Píshín, Balúchistán	—	Feb. 10.
12 ♂. Gishtigán, Bampusht, Balúchistán	3000	Feb. 29.
13 ♂. Sib, near Dizak, Balúchistán	4000	March 26.
14 ♂. Magas, between Dizak and Bampúr, Balúchistán	4200	March 29.
15 ♂. Tehrúd, west of Bam, South-east Persia	5500	April 28.
16 ♂. Sarján, south-west of Karmán	5700	May 29.
17 young ♀. Near Parpá, 150 miles east of Shiráz	6000	May 30.
18, 19 ♂, 20 ♀ ?. Shiráz	4750	September.

This is very abundant in Balúchistán in winter, and in many parts of Southern Persia, where it breeds, in spring and summer. In Northern Persia I did not notice it, nor was it obtained by De Filippi, whose specimens were procured at Bandar Abbás, on the Persian Gulf, by the Marchese Doria. I found the nest on May the 31st in a small hollow by the side of a bush in a plain covered with scattered low vegetation. There were two young birds, and one egg of a pale greenish blue colour.

Mr. Hume (Ibis, 1870, p. 283, Lahore to Yarkund, p. 205, and Stray Feathers, i, p. 188) has pointed out the identity of *Saxicola deserti*, Rüpp., *S. atrogularis*, Blyth, and *S. montana*, Gould, and has shown the supposed differences to be due to seasonal changes. Dr. Stoliczka (J. A. S. B. 1872, xli, p. 239) has expressed himself to the same effect. After examining numerous specimens of this bird from the Abyssinian coast of the Red Sea, Palestine, Syria, Persia, and India, I entirely coincide in Mr. Hume's opinion. In the autumn and winter plumage the black feathers of the throat in the male have white tips, sometimes in young birds to such an extent as almost to conceal the black, the axillaries are white, and the edge of the wing beneath mixed white and black as in *S. œnanthe.* The amount of white varies in different specimens, being probably less in old birds. As the spring comes on the white edges of the throat feathers wear off, the under wing coverts become entirely black, and the axillaries are all black at the base, the tips only remaining white. Both back and lower breast also become paler and more sandy, and the rump, tail coverts, abdomen, and in some specimens even the lower breast, which are buff in winter plumage, become white.

I am rather surprised to find that Messrs. Tristram (Ibis, 1859, p. 300, (and Taylor,) ib. 1867, p. 60) state that the sexes in *S. deserti* are alike. Until lately I was not aware that any doubt existed on this subject. I have collected females without the black breast in Abyssinia, Persia, and India, and the same has been done by numerous other Indian collectors, Hume, Brooks, Beavan, etc., specimens obtained by whom are in several English collections. Still, as I have never paid especial attention to this matter, I am not in a position to assert that none of the black-breasted birds are females. I can scarcely suppose that Messrs. Tristram and Taylor are both mistaken, and it is very probable that other observers, like myself, being under the impression that all the black-throated birds are necessarily males, have omitted to dissect them. Perhaps old females have a black throat. But it is quite certain that numerous females without a black throat also occur, although they are less numerous than the black-throated birds; and I may add, that young males can only be distinguished by turning up the throat feathers, which will be found to be black at the base.

In all ages and sexes *S. deserti* may be distinguished by the length of the black tips to the lateral tail feathers. In plumage the female closely resembles *S. isabellina*, and the male approaches *S. melanoleuca,* but in both sexes, and at all ages, from the nestling, so soon as the tail feathers are sufficiently grown, the black tips to the outer rectrices are upwards of an inch in length.

83. S. melanoleuca, (Güld.)—De F.

S. xanthomelæna, H. and E. Symb. Phys. Aves, fol. aa.
S. eurymelæna, H. and E. id. fol. bb.
(?) *S. stapazina*, Tem. apud De Filippi, Viag. in Pers. p. 347.
S. Hendersoni, Hume, Ibis, 1871, p. 480.

1 ♂. Shiráz	5000	..	June.

Evidently a rare bird in Persia, though it must traverse the country occasionally, since it breeds as far to the east as Yarkand.

84. S. erythræa, H. and E.

Hemp. and Ehr. Symb. Phys. Aves, fol. cc.
S. libanotica, H. and E. apud Tristr. Ibis, 1867, pp. 91, 94, nec H. and E.
S. Finschi, v. Heugl. Orn. N. O. Afr. p. 350.

1 ♂. Khán-i-súrkh, south-west of Karmán	8000	..	May 22.
2 ♂. Shiráz	5000	..	June 13.
3 ♂. Shiráz	5000	..	June.
4 ♂. Shiráz	—	..	—

S. erythræa doubtless breeds in Persia, but it appears rare, and has hitherto only been obtained in the southern portion of the highlands. It has not been observed in the countries farther to the eastward.

85. S. stapazina, (L.), nec auct.—De F.

S. albicollis, Vieil., Nouv. Dict. xxi, p. 424.
S. aurita, Tem., De F. Viag. in Pers. p. 347.
S. amphileuca, H. and E. Symb. Phys. fol. bb.

1, 2 young ♂. Near Shiráz	5000	..	September.
3 ♂. Shiráz	5000	..	—

The black-eared chat, which Mr. Dresser and I have shown to be the true *S. stapazina* of Linnæus, has been obtained in North-western Persia by De Filippi, and near Shiráz by Major St. John. It is not known to range farther to the east.

86. S. monacha, Rüpp.

1 ♂. Rás Malán, Balúchistán coast	Nov. 27.
2 ♂. Gwádar, Balúchistán coast	Jan. 2.

3 ♀. Dasht river, near Gwádar	.. .. ..	Jan. 25.
4 ♂. Samán, Dasht, Balúchistán	.. .. ..	Jan. 27.
5 ♀. Báhú Kalát, Balúchistán	.. .. ..	Feb. 1.

This fine chat appears to be very rare in collections. Of all the *Saxicolæ*, none are more thoroughly desert birds; I only met with it in the dreariest of plains and hills, and its favourite resort appeared to be the sandhills on the Makrán coast. I may have seen it in Persia and mistaken it for *S. leucomela*, but I do not think I did, and I certainly never shot it. Similarly Mr. Tristram met with it in salt deserts near the Dead Sea, Captain Shelley in Egypt, Mr. Wyatt near Sinai, and Mr. Hume on the frontiers of Sind, always in the most barren and desolate portions of the country. It is well figured in Shelley's 'Birds of Egypt,' Pl. II, and in Sharpe and Dresser's 'Birds of Europe.'

The range of *S. monacha* may be considered as fairly determined. It extends from North-eastern Africa (Nubia and Egypt) to the frontier of Sind, but does not appear to migrate much farther north than 30° N.

87. **S. chrysopygia,** (De F.), Pl. X, fig. 1.

Dromolæa chrysopygia, De F. Archiv. per la Zool. Genova, ii, p. 381; Viag. Persia, p. 347.

S. Kingi, Hume, Ibis, 1871, p. 29; Stray Feathers, i, p. 187.—Stoliczka, J. A. S. B. 1872, xli, p. 239.

1 ♀. Gwádar, Balúchistán	.. ..	—	..	December.
2 ♀. Ráyín, south-south-east of Karmán		9000	..	May 1.
3 ♀. Oak forest, near Shiráz	.. ..	(?)	..	June.
4 young ♂. Kohrúd, north of Isfahán		8000	..	July 22.

I obtained four specimens and Major St. John one of this peculiar and interesting form, but the label of one of my specimens has been lost, and I can only say that it was shot somewhere in Southern Persia. This species appears to have the sexes alike, and, so far as is hitherto known, to have no seasonal change of colour. It has been admirably described by Mr. Hume (as *S. Kingi*), and his account of the habits (Stray Feathers, i, p. 188) agrees with my own observations. It haunts rocks and probably breeds amongst them, my specimens 2 and 4 having been shot in stony ravines, whilst De Filippi's types were procured 'in the highest and most stony parts of the hills which encircle Demavend.' It is thus shown to occur throughout Persia (in summer at all events), in Balúchistán, Sind, Kachh, and North-western India, but it has not been met with west of Persia, nor east of the desert region of North-western India[1].

This species has hitherto been unknown in Europe, and Mr. Tristram (Ibis, 1867, p. 93) suggested that De Filippi's type was a female of *S. philothamna* (=*S. mœsta*, Licht. *vera*, nec auct.), a view which was accepted, though with doubt, by Sharpe and Dresser in their 'Birds of Europe.' My discovery of this bird in Persia clearly shows what De Filippi's species is, although his type has been lost.

88. **S. leucomela**, (Pall.)—De F.

Hume, Stray Feathers, i, p. 185.—De F. Viag. in Persia, p. 347.
S. lugens, Licht, Verz. Doubl. p. 33.

1	♂.	Near Ráyín, south-south-east of Karmán	9000	..	May 2.
2	♂.	Shiráz	5000	..	June 13.
3	♀.	Shiráz	5000	..	August.
4	♂.	Shiráz	5000	..	—

This bird was not often seen, but still it was occasionally observed on the southern portion of the Persian highlands. De Filippi states that he procured it in the neighbourhood of Tehrán. There are two skins from his collection at Turin, but they have no exact locality assigned.

In distinguishing this bird from its near ally *S. morio*, the buff under tail coverts are not so good a character (although they are always less rufous in the latter) as the under surface of the wing. In *S. leucomela* the quills have a white inner margin, which is wanting in *S. morio*.

89. **S. morio**, H. and E.

S. leucomela, Gould, Birds of Asia, pt. xvii.—Jerdon, Birds of India, ii, p. 131, nec Pallas.
S. capistrata, Hume, Ibis, 1868, p. 233; Stray Feathers, i, p. 184, nec Gould.

1	♂.	Shiráz	5000	..	June.

The single specimen collected was obtained by Major St. John, and is important as showing that this bird must breed in Southern Persia. I may have seen it, but if so I mistook it for the preceding species.

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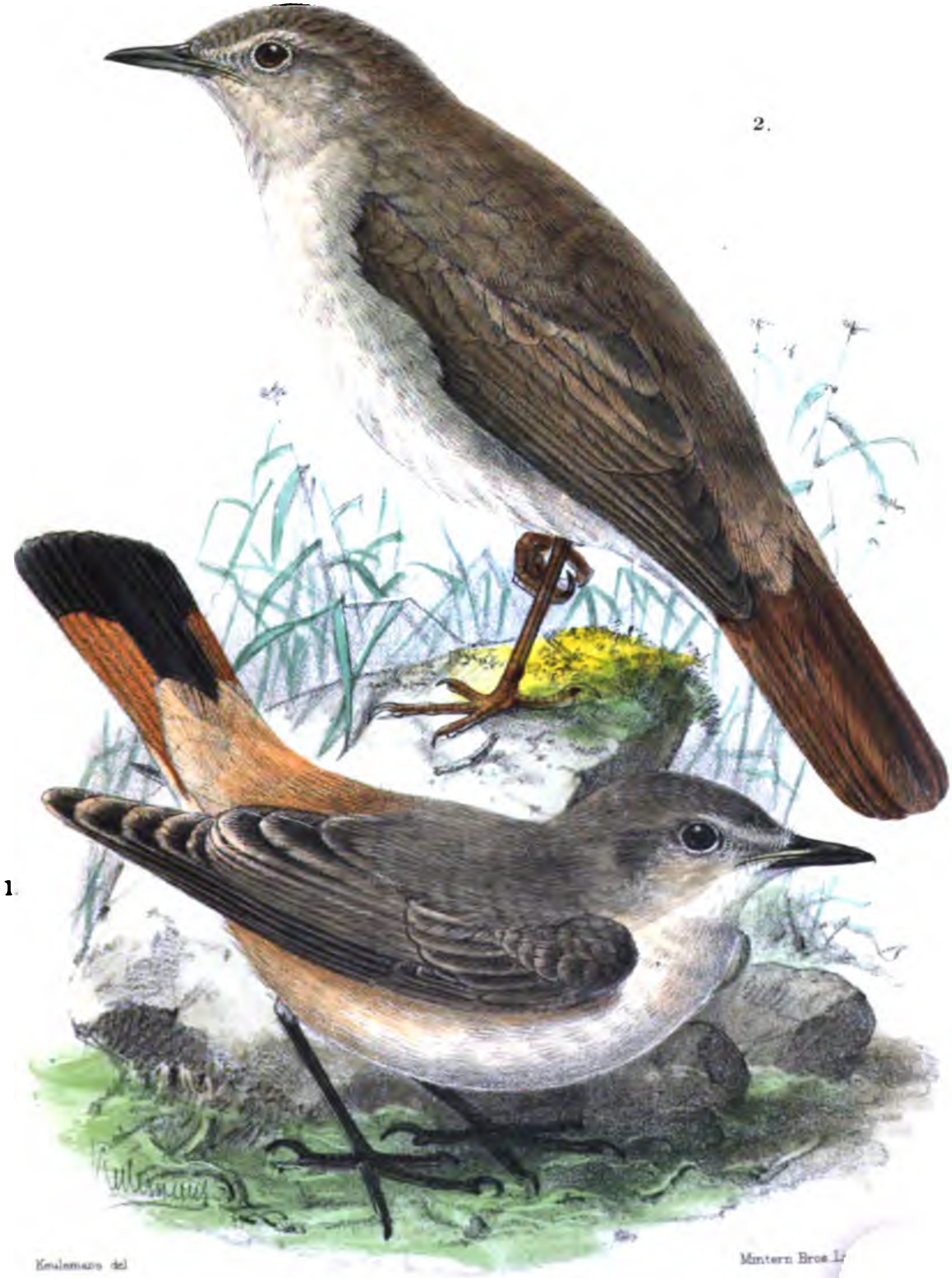
[1] Unless a specimen which I once obtained near Nágpúr, but subsequently lost, belonged to this species, which, from my recollection of the skin, I think possible.



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1. SAXICOLA CHRYSOPYGIA.
2. DAULIAS HAFIZI.

90. S. albonigra, Hume, Pl. XI.

Stray Feathers, i, pp. 2, 185.

1 ♂. Gwádar, Balúchistán	—	December.
2 ♀, 3 young ♂. Karmán	5800	May 10.

I had already noted this form as distinct from *S. picata* when I received the first number of Mr. Hume's ornithological publication in which it is described. It unmistakably differs from *S. picata,* not only in its larger dimensions, but also in the circumstance that the female and young are similar in colouration to the adult male, whilst the female and young *S. picata* are dusky, not black. I did not distinguish the two species in the field, but, I think, had *S. albonigra* been common, I should have obtained more specimens, because my principal object was to ascertain, so far as I could, the range of the different species, and in consequence I occasionally took specimens of all, a skin being a far more trustworthy record than a mere note of a bird's occurrence.

On May the 10th, close to Karmán, I found a female and two young birds of this chat in a small cave under a limestone hill. The young ones were nestlings, scarcely able to fly, but precisely similar in colouration to the adults.

Mr. Hume suggests that this bird may be a stage of *S. monacha,* but in this I cannot agree. The female of *S. monacha* appears to be always brown, and in all specimens which I have seen there are only broad black tips to the central pair of rectrices, and much narrower ones to the two outer pairs, the intermediate tail feathers being white throughout. *S. monacha* also has a much longer bill and a longer tail.

Mr. Hume found this bird at the foot of the stony barren hills on the Sind frontier and along the Makrán coast. So far as it is possible to judge, it appears to have a somewhat restricted range, but it may be found hereafter farther to the West. It is noteworthy, however, that it was not obtained at Shiráz by Major St. John.

91. S. picata, Blyth.

Jerdon, Birds of India, ii, p. 131.—Hume, Ibis, 1868, p. 233; Stray Feathers, i, pp. 3, 184.

1 ♀. Dasht river, Balúchistán	—	Jan. 26.
2 ♀. Báhú Kalát, Balúchistán	—	Feb. 1.

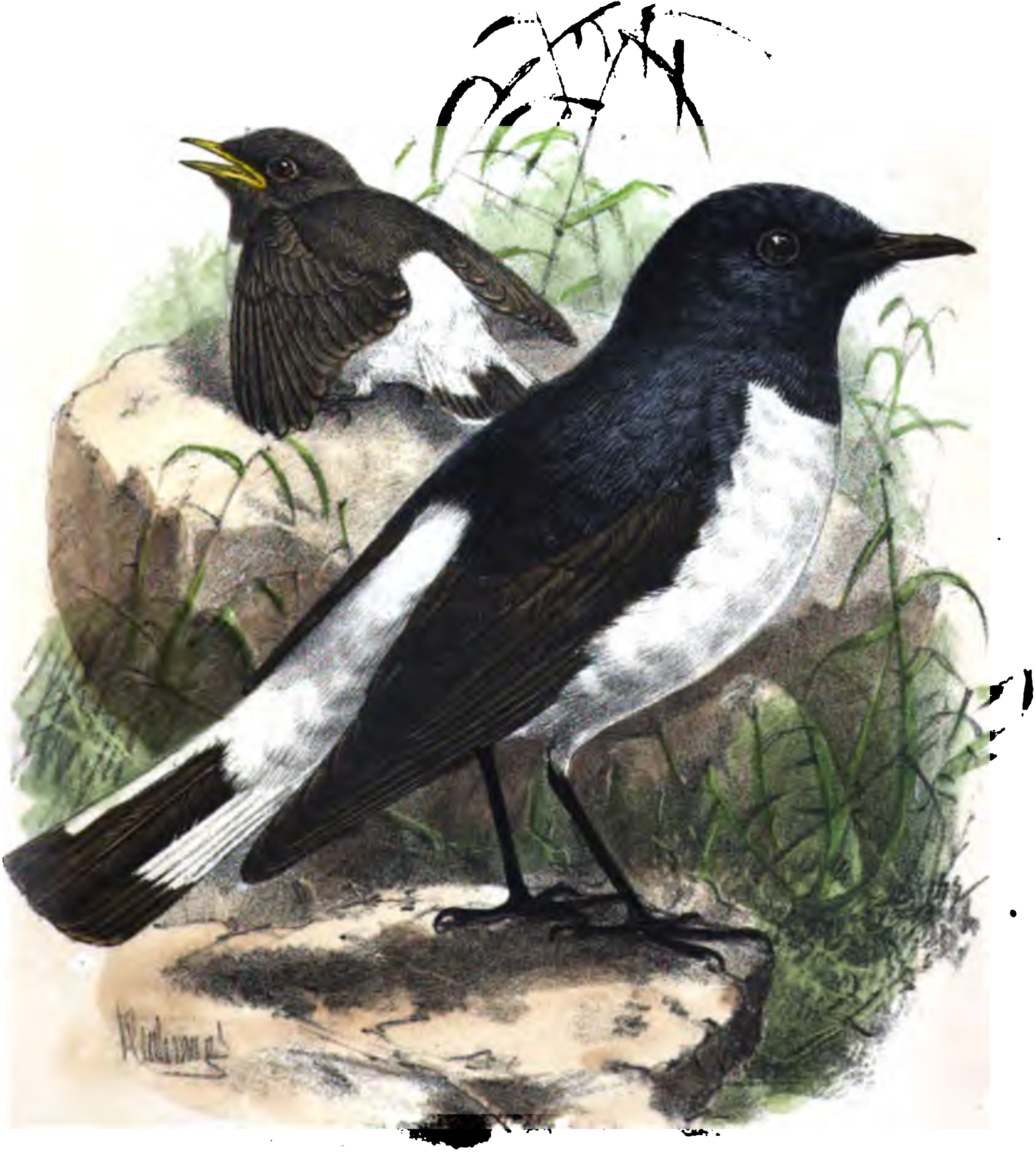
3 ♂. Ghistigán, Bampusht, Balúchistán	3000	Feb. 28.
4 ♂. Askán, Bampusht, Balúchistán	3500	March 5.
5 ♂. Near Kalagán, Balúchistán	4000	March 20.
6 young ♂. Sarján, south-west of Karmán	6500	May 23.
7 ♂. Niríz, east of Shiráz	6000	June 2.
8 ♂. ? Elburz mountains, North Persia	—	? February.

Mr. Hume (l. c.) thinks he had ascertained beyond doubt that *S. capistrata* (Hume, nec Gould = *S. morio*, H. and E.) is only the young male of this species. The males of the two forms only differ in that of the latter possessing a white head, much as in the case of *S. leucopyga*, and *S. leucocephala*, now known to be identical. The female of *S. morio* is not known with certainty. There are, however, strong reasons for doubting Mr. Hume's conclusion. In the first place the range of the two forms, so far as we know, is quite different. *S. picata* has hitherto only been found in India and Persia; *S. morio* extends to Eastern Europe, Arabia, and North-eastern Africa. In these countries many specimens of the latter bird have been collected by Hemprich and Ehrenberg, v. Heuglin and others, whilst no specimen of *S. picata* has ever been procured. In the same way, from Persia, where *S. picata* is common and breeds, I never obtained *S. morio*, and only one specimen was procured by Major St. John. Secondly, if *S. picata* is the adult of *S. morio*, it is singular that no similar phase is known in the closely allied *S. leucomela* (*vera*, nec auct). Lastly, although we do not positively know the female of *S. morio*, we are well acquainted with that of *S. leucomela*, which resembles the male. Mr. Hume certainly says he has seen females precisely like those of *S. picata* in company with males of *S. capistrata* (*S. morio*), but it must be borne in mind that this observation was not made in the breeding season, and two *Saxicolæ* of similar habits, as these species are, may not improbably be seen together, although belonging to different forms. For the present therefore, whilst admitting the importance of Mr. Hume's observations, I think it best to wait for further evidence.

I shot a male of *S. picata* singing, and on dissection found that it was breeding on the second of June, but I had killed a young bird, probably of the year, fully grown, before, on May the 23rd.

S. picata was common in Balúchistán in January and February. It breeds throughout the Southern highlands of Persia. I cannot help thinking that there may be some mistake about a specimen in Major St. John's collection labelled as collected in the Elburz moun-

Pl XI.
Zoology of Persia



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SAXICOLA ALBONIGRA

tains in February. The bird is, however, correctly named on the label. There is no other evidence for the existence of the bird in Northern Persia. I did not myself observe it north of Shiráz, and it does not appear hitherto to have been found in Central Asia.

Other *Saxicolæ* which may be looked for in the Persian area are *S. vittata*, Hemp. and Ehr., from Arabia, lately discovered in Turkestán by Severtzov, described by him as *S. melanogenys*, and figured as *S. melanotes* (Turk. Jevotn. p. 120, Pl. VIII, figs. 5, 6), *S. opistholeuca*, Strickl., hitherto only known from North-western India, and the rare *S. xanthoprymna*, H. and E.

Cercomela melanura, Rüpp., from Arabia and North-eastern Africa, was included in the fauna of Western India by Blyth and Jerdon on the authority of a figure in some drawings collected by Sir A. Burnes in Sind. Hume (Stray Feathers, i, p. 188) shows that the drawing in question probably represents *S. chrysopygia* (*S. Kingi*), and adds that if *C. melanura* had been a regular inhabitant of Sind it could scarcely have escaped the observation of himself and his collectors. I am well acquainted with the bird, which I saw and shot frequently on the Abyssinian coast. I was on the look-out for it throughout my journey in Balúchistán, and I am certain I never saw it. It would be difficult to name a bird not possessing brilliant plumage which could be more easily recognised, and I have no hesitation in endorsing Mr. Hume's opinion. I believe the name may be safely erased from the Indian fauna.

92. Monticola cyana, (L.)

Petrocossyphus cyanus, auct.

1 ♂. 150 miles east of Shiráz, South Persia	7000 ..	May 30.
2 ♂, 3 ♀. Oak forest, near Shiráz ..	6000 ..	June.
4, 5 ♂. Near Shiráz	6000 ..	—
6 young ♂. Shiráz	4700 ..	—
7 young ♀. Lura valley, Elburz mountains, North Persia	6500 ..	Aug. 9.
8 young ♂. Lura valley, Elburz mountains, North Persia	6500 ..	Aug. 16.

After the elaborate memoir on this bird in Sharpe and Dresser's 'Birds of Europe,' there is but little to be added to the natural history of the species. Of all the above specimens only No. 1 is in adult male plumage, all the others have pale margins to the feathers. The wings in the male specimens measure 4.7 to 4.8 in., in the female, No. 3, 4.5; culmen 0.9 to 0.98.

There can be but little doubt that this species breeds throughout the hilly parts of Persia. I did not notice any in Balúchistán in winter, but Hume saw it on the Makrán coast.

93. **M. saxatilis**, (L.)—De F.

P. castaneocollis, Less. Rev. Zool. 1840, p. 166.—Stoliczka, J. A. S. B. 1868, xxxvii, pt. ii, p. 34, note.

1 ♂. Kúh-i-hazár, south-south-east of Karmán	9000	April 30.
2, 3 ♂. Oak forest, near Shiráz	6000	June.
5 ♂. Eklíd pass, north of Shiráz	—	—
5 young. Near Kohrúd, north of Isfahán	9000	July 17.
6 young ♂. Elburz mountains, north of Tehrán	8000	Aug. 14.

Common in the mountainous parts of Persia, in which it must breed about May or June, for the young bird shot on the 17th of July is a fully grown specimen. This bird I shot on a telegraph wire, a common perch for kestrils, shrikes, chats, swallows, and other insectivorous birds, as well as for doves and sparrows. Both this and the other young specimen, obtained a month later, are in nearly the plumage represented in the right-hand figure of the second plate in Sharpe and Dresser's 'Birds of Europe.'

94. **Turdus musicus**, L.

1 ♂. Khisht, north-east of Bushire, South Persia	1800	January.
2 ♂. Oak forest, near Shiráz	4000	January.
3 young ♂. Anán, north slope of Elburz mountains, north of Tehrán	6500	Aug. 12.
4 ♀. Resht, near the Caspian Sea	—	October.
5 ♀. Shores of the Caspian Sea	—	November.

The occurrence of the European song-thrush so far to the south-east as the neighbourhood of the Persian Gulf, adds considerably to the known range of the species. It had previously been obtained from Northern Arabia, Palestine, and Armenia, as well as from several parts of Northern Asia, but it was not noticed by De Filippi in Persia, nor did I myself see it except in Mazandarán and Ghílán, on the Caspian side of the Elburz mountains. It is probably only a winter visitant to Southern Persia, though it evidently breeds in the north. Major

St. John's specimens from the former were procured in midwinter, whilst I saw none in the neighbourhood of Shiráz, when I passed through in May and June.

95. *T. viscivorus, L.

T. Hodgsoni, Lafr., Jerdon, Birds of India, i, p. 531.

I did not meet with the missel-thrush myself, but it has been shot by Major St. John in Southern Persia near Kázrún. Ménétries found it common on the summit of the Tálish mountains in June.

[I find in my note book that I shot a missel-thrush in the oak forest above Kázrún (4200 feet) on the 29th of December, 1866. The length was nearly 12 inches, the wing 6¼. It is not uncommon in Southern Persia in winter.—O. St. J.]

96. * Turdus iliacus, L.

Found in the forests of Lankorán on the Caspian by Ménétries.

97. T. merula, L.—De F.

1 ♂. Shiráz	5000	—
2 young ♀. Shiráz	4750	June.
3 ♂, 4 young ♂. Near Shiráz	6000	—
5 young ♀. Máyín Kotal, north of Shiráz	5500	June 24.
6 ♀. Kohrúd, north of Isfahán	7000	July 19.
7. Anán, Elburz mountains, north of Tehrán	6500	Aug 12.

The range of the blackbird in Persia appears to be the same as that of the song-thrush, but whereas it is probable that the latter leaves Southern Persia for more northern regions in summer, the former remains and breeds in the better wooded valleys around Shiráz, for I saw old and young together in June at Máyín Kotal. I also met with this bird occasionally in gardens. In Mazandarán and Ghílán it is common.

Whilst the male bird does not differ from European specimens, the female and young birds are decidedly less rufous, there being no ferruginous tint on the breast of the female, whilst the young is dark earthy brown above, the feathers of the head, upper back, and smaller coverts with pale central stripes, tail nearly black, lower parts dirty white with irregular brown transverse spots, formed by the terminal portion of each feather. The measurements slightly exceed the average in European birds. I append those of two specimens:—

	Wing.	Tail.	Tarsus.	Culmen.
Male, Shiráz	5.1	4.5	1.3	1
Female, Máyin	5	4.4	1.35	1

98. T. torquatus, L.

1 ♂ young. Laru valley, Elburz mountains, north of Tehrán	7000	Aug. 10.

The occurrence of this bird in Persia appears to have been already noticed by Pallas (Zoogr. Ros. As. i, p. 451). Both Pallas and Ménétries obtained it in the Caucasus. My only specimen was shot by a collector at a considerable height on the Elburz. It is probable that the bird breeds in those mountains.

The only example obtained is in a phase of plumage intermediate between that of the young on leaving the nest, as figured in Sharpe and Dresser's 'Birds of Europe,' and that of the adult male in winter plumage. The head and hind neck are brown, back blackish brown with narrow paler edgings, broader and more rufous above than below; tail nearly black, quills and larger coverts dark brown, with whitish edges; throat dirty white, with numerous dark brown spots towards the edges; pectoral gorget well developed, pale greyish pink; rest of under parts blackish brown, with whitish margins to the feathers: wing 5.4 in., tail 4.2, tarsus 1.3, culmen 0.85.

99. T. atrigularis, Tem.

Planesticus atrogularis, Jerdon, Birds of India, i, p. 529.—Stoliczka, J. A. S. B. 1868, xxvii, pt. ii, p. 35.

Cichloides atrogularis, Hume, Stray Feathers, i, p. 179.—Tytler, Ibis, 1869 p. 124.

1, 2, 3, 4, 5 ♂, 6, 7 ♀. Gwádar, Balúchistán coast	— ..	December.
8 ♂. Gwádar, Balúchistán coast	— ..	Jan. 13.
9 ♀. Gwádar, Balúchistán	— ..	Jan. 15.
10 ♀. Mand, Balúchistán	800 ..	Feb. 13.

The winter plumage of this bird has been well described by Tytler and Stoliczka (l. c.); Jerdon's description is that of a young bird.

I found the black-throated thrush common in Balúchistán in winter. It was especially so in the miserable apologies for gardens at Gwádar, one of the most desolate of inhabited spots on the earth's surface, where

I can only explain the occurrence of this bird by the circumstance of its being unable to migrate further south on account of the sea; and as confirming this view, I may mention that I saw several of these birds on some very cold days in January, when, as we afterwards learnt, all the higher plains in Persia were covered with snow. The birds were very tame, searching for food around the houses on the open sand-downs. Elsewhere I only saw this bird in fairly wooded localities, such as the plains of Píshín and Mand. I, however, did not see it in the much more fertile and better wooded plains of Bampúr and Narmashír, and I think it probable that before I reached those places, in the commencement of April, these birds had migrated northwards. Nor did either Major St. John or I ever meet with *T. atrigularis* on the Persian plateau, although this species is found in Europe, as well as in Northern Asia, the Himalayas, and North-western India.

It is probable that *Turdus fuscatus*, Pall., and *T. pilaris*, L., also occur in Persia in winter, as they have been recorded from the countries both east and west, but as yet neither of them appears to have been observed within our area.

100. * ? Oreocincla varia, (Pall.)

Major St. John is satisfied that he has seen this bird at Tehrán.

101. Erythacus rubecula, (Lath.)

1 ♀. Shiráz, South Persia .. .. 4700 .. July.

The robin is not found in the barren regions of Persia, and the form which abounds on the Caspian appears to be distinguishable from the common European species, but a single skin, obtained by Major St. John's collector at Shiráz, precisely agrees with European specimens. This locality is probably the south-eastern limit of this bird's range, which will, in all likelihood, be found to extend throughout the wooded hills which divide the Persian plateau from the lowlands of Mesopotamia. If M. Verreaux has correctly identified a specimen obtained by Mr. Hume, the Japanese species *Erythacus akahige* is found in the North-western Himalayas (Ibis, 1871, p. 31).

I think there can be little doubt but that the robins obtained by De Filippi in Northern Persia belonged to the next race.

[The specimen in the collection was obtained by my collector, in the neighbourhood of Shiráz, during my absence in the north. I have occasionally observed a bird in thickets about river beds in the south, bearing a strong resemblance to the common redbreast, but from its shy, unfamiliar habits, I always put it down as *Erythrosterna parva*. However, as it is certainly not the redbreast which we found so common about Resht on the Caspian, I can only suppose that the collector's story is correct, and that he did get the specimen near Shiráz.—O. St. J.]

102. **Erythacus Hyrcanus**, W. Blanf. Pl. XV, fig. 1.—De F.

Ibis, 1874, p. 79.
E. rubecula, De Filippi, Viag. in Pers. p. 347.
? *Sylvia rubecula*, Mén. Cat. Rais. p. 35.
1, 2, 3, 4 ♂, 5 ♀. Resht, Ghilán. .. .. .. October.

E. *affinis* E. rubeculæ *sed pectore rufo saturatiore, supracaudalibus ferrugineis, fronte rufá latiore et rostro longiore distinguendus.*

Hab. in provinciá Persicá hodierná Ghilan dictá (antice Hyrcaniæ parte) ad litus meridionale maris Caspii.

Colour above umber brown, more or less tinged with olivaceous; upper tail coverts dull ferruginous; tail feathers rufous brown, the outer webs towards the base having a strong rusty tinge; quills and wing coverts hair brown, the margins rather paler and more rufous; forehead with the anterior portion of the region above the eyes, sides of neck below the ear coverts, throat and breast rich ferruginous red, deeper than in *E. rubecula;* lower breast and abdomen white; under tail coverts isabelline, sides of abdomen and thigh coverts pale rufescent olive.

The following are the dimensions of a pair of skins of *E. Hyrcanus* from Resht, of the specimen from Shiráz, and of two European skins of *E. rubecula* from Mr. Dresser's collection:—

	Wing.	Tail.	Tarsus.	Culmen.	Bill from nostril.
Male, Resht (*E. Hyrcanus*) ..	2.9	2.45	1.05	0.65	0.34
Female, Resht (*E. Hyrcanus*) ..	2.8	2.2	1.02	0.65	0.32
Female, Shiráz (*E. rubecula*) ..	2.85	2.2	.98	0.6	0.3
Male, Piedmont (*E. rubecula*) ..	2.83	2.2	1	0.55	0.28
Crimea (*E. rubecula*)	2.92	2.45	1.1	0.56	0.3

The most characteristic distinction of the North Persian species, judging by the specimens before me, is the deep ferruginous tint of the upper tail coverts, and of the outer webs of the rectrices towards their base. The rufous of the breast too is much deeper, and the bill rather longer than in the European form. *E. Hyrcanus* cannot be considered as more than a local race of *E. rubecula*, and it is with great hesitation that I venture to separate it. It abounds in the forest district near the Caspian, where alone I observed it. All the specimens procured were collected by Major St. John.

De Filippi obtained specimens of *Erythacus* from Kend in the neighbourhood of Tehrán[1], as well as from Ghilán. They probably belonged to the present species which may straggle across the Elburz into the gardens near the Persian capital. I never saw robins at any elevation in the Elburz mountains, nor did I meet with them near Tehrán.

Ménétries states that *Sylvia rubecula* is not common at Lankorán. Probably the species is the same as at Resht.

[This redbreast was found plentifully about Resht, on the shores of the Caspian. My Bengali collector, never having seen such a bird before, shot and skinned half-a-dozen or more, for which I, in my superior wisdom, rebuked him as waste of time, having no doubt but that it was the common English redbreast. It is thus by a mere chance that it is not represented in the collection by a single specimen.—O. St. J.]

103. **Cossypha** (*Irania*) **gutturalis**, Guér.—De F.

Guérin, Rev. Zool. 1843, p. 162.—Ferr. et Gall. Voy. en Abyssinie, Atlas, Pl. V.—Finsch, Tr. Z. S. vii, p. 243.—Sharpe and Dresser, Birds of Europe, pt. xiv.

Saxicola albigularis, Pelz. Sitzungsb. Akad. Wiss. Wien, xlviii, p. 150.

Bessornis albigularis, Tristram, Ibis, 1867, p. 89, Pl. I.

Irania Finoti, De F. Archiv. per Zool. Genova, ii, p. 381; Viag. in Persia, p. 347.—Salvadori, Atti R. Acad. Sci. Tor. 1868, vol. iii, p. 283.

1 young ♂ ?. Near Niríz, east of Shiráz	7000	June 1.
2 ♂, 3, 4 ♀. Shiráz	5000	June.
6 ♂. Shiráz	5000	July.
7 ♂, 8 young ♂. Shiráz	5000	August.
9 ♂, 10 ♀. Shiráz	5000	September.
11 ♀. Lura valley, Elburz mountains, north of Tehrán	6500	August 8.
12, 13 ♂. Lura valley, Elburz mountains, north of Tehrán	6500	August 16.

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[1] In this case however, as in many others, he appears only to have noted the occurrence of the birds, and not to have preserved skins, since there are no specimens at Turin.

This handsome chat is probably found in summer throughout the hills of South-western, Western, and Northern Persia, wherever there is a sufficiency of cover. I first saw it, I believe, at Khán-i-súrkh, about seventy miles south-west of Karmán. As it is essentially a bush bird, it is not to be looked for on the desert plains and barren hills of Central Persia. On account of its skulking habits, it may easily pass unnoticed, and it may possibly be much more common than it appeared to be; indeed, it must be far from rare around Shiráz, to judge by the fine series collected there by Major St. John.

Persia is the most eastern locality in which this chat has hitherto been found; its range extending thence to North-eastern Africa. It is probably migratory, and some of the birds found in Persia in summer may go to the shores of the Red Sea in winter, taking, like some other species, a line of migration from north-east to south-west.

As regards the habits of *Cossypha gutturalis,* I have but little to add to what has been stated by Messrs. Sharpe and Dresser in the 'Birds of Europe.' It is essentially a bush bird, so far as my observations extend, silent and shy. I saw two or three individuals at different times in some bushy ground on the banks of the Lura or Karij river in the Elburz mountains, and I had occasion to notice their habit of escaping, when pursued or watched, into a bush, and sitting immovable amongst the branches. Messrs. Tristram and Krüper have described this species as much more active and lively than it appeared to me to be, but the difference is naturally due to their observations having been made in the breeding season.

There is a remarkable similarity between the colouration of *Cossypha gutturalis* and that of several Himalayan bush birds, especially *Ianthia rufilata*, *I. hyperythra*, and *Larvivora superciliaris;* but these species have shorter, more rounded wings, and longer tarsi than *Cossypha.* There is also a similar distribution of colour in *Calliope*, in *Nitidula*, and in some species of *Siphia* and *Cyornis*. What may be the exact explanation of this striking similarity it is difficult to say, but it must, I think, indicate affinity. In external structure this bird approaches as nearly to *Saxicola* as to any of the *Ruticillinæ,* but its habits agree with those of the latter group, and so does its colouration. Count Salvadori has pointed out that it has a much more pointed wing than any of the true *Cossyphæ*, and he considers that the genus *Irania* of De Filippi, founded for this species, should be kept distinct from *Cossypha.* The difference is certainly as great as in many universally admitted genera, and this bird is, I think, fairly entitled to subgeneric rank at least.

The two young specimens of this species figured in Sharpe and Dresser's 'Birds of Europe,' are Nos. 1 and 8 of the preceding list. The sex of the Niríz specimen was marked as female on the ticket. I was marching rapidly at the time, and I am under the impression that I did not ascertain the sex myself, so the determination is doubtful; but the collector who was with me made but few mistakes, and I think it not improbable that this bird was an old female taking on the male plumage. Still the appearance is that of a young male.

The type of *Irania Finoti*, De F., now in the Museum of Turin, is a young bird, with pale spots at the ends of the wing coverts, and may be of either sex.

104. Ruticilla phœnicura, (L.)—De F.

(?) 1 ♀. Shiráz .. .. 5000 .. December.

Amongst the collections made by Major St. John in Shiráz is a female redstart, which I think probably belongs to this species. It is more pale-coloured than females of *R. rufiventris*, and it has decidedly shorter tarsi and bill, whilst it exactly agrees, in these particulars, with European specimens of the common redstart. But as I have no male birds of this species from Southern Persia, I am in some doubt as to whether this may not be a hen bird of *R. erythroprocta*, Gould, the female of which does not appear to be distinguishable from that of *R. phœnicura*. As, however, no specimens of *R. erythroprocta* have been procured hitherto in Persia, whilst De Filippi found *R. phœnicura* breeding in the gardens of Kazvín, north-west of Tehrán, and Ménétries met with it abundantly at Lankorán on the Caspian, I think it more probable that the Shiráz skin belonged to the latter species.

Blyth (Ibis, 1867, p. 15) and Jerdon (Birds of India, vol. ii. app. p. 876) consider it probable that the reports of this bird's occurrence in India are founded in error, so we have no authenticated instance of its being found east of Shiráz.

105. R. rufiventris, (Vieil).

Le Traquet à cul roux, Levail, Ois. d'Afrique, Pl. 188, fig. 3.
Œnanthe rufiventris, Vieil. Nouv. Dict. d'Hist. Nat. xxi, p. 431.
Ruticilla atrata, Jard. and Sel. Ill. Orn. Pl. 86, fig. 3.

R. Nipalensis, v. *atrata*, Hodgs. Gray's Zool. Misc. (1844), p. 83.—Horsfield and Moore, Cat. Mus. E. I. Co. i, p. 302.

R. Indica, Blyth, Cat. Birds Mus. A. S. p. 168.

R. phœnicuroides, Moore, P. Z. S. 1854, p. 25, Pl. LVII.

1 ♂, 2 ♀, Píshín, Balúchistán	600	Feb. 8.
3 ♂. Ghistigán, Bampusht, Balúchistán	3000	Feb. 28.
4 ♂. Jálk, Balúchistán	3000	March 17.
5 ♀. West of Bam, south-eastern Persia	6000	April 27.

Hume, in 'Stray Feathers,' vol. i, p. 189, has expressed an opinion that *R. phœnicuroides* of Moore is merely the autumn plumage of *R. rufiventris*, Vieil, and that *R. erythroprocta*, Gould, belongs to the same species. So far as *Ruticilla phœnicuroides*[1] is concerned, I am inclined to agree. I can see no difference between undoubted male specimens of *R. rufiventris* from Eastern India, and others from Sind and Persia, agreeing well with the description of *R. phœnicuroides*; but females from the latter country have the lower parts much paler, and the lower abdomen and under tail coverts less rufous than those I have seen from the former. This difference, however, may be seasonal, all the skins of hens of *R. rufiventris* from India, to which I have access, being those of birds shot in winter, whilst my two specimens from Balúchistán and Persia were killed in February and April, and that shot in the latter month has the throat and breast decidedly paler than the February bird. The males vary much in plumage, as mentioned by Hume; there being, first, the plumage described by Jerdon, with the crown of the head grey, and the remainder of the upper parts to the rump black; the feathers having more or less grey (or rather brown) edges; then the birds with a black mantle and forehead, the grey of the crown being sometimes confined to the anterior portion, just behind the black frontal band; and, lastly, the *phœnicuroides* stage with the whole mantle and crown grey, the forehead remaining black. So far as birds from Balúchistán are concerned, this last would appear to be the colouration of birds in spring, but Hume (l. c.) calls it the autumn plumage. At all events, the blackest specimen I possess was shot at Karáchí in December, and one with the whole upper parts to the rump grey was killed at Jálk on March the 17th, whilst the specimen shot on February the 28th is in intermediate plumage. All have the sides of the head, throat, and breast black, lower breast, abdomen, under wing coverts and axillaries, deep ferruginous red.

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[1] The type of this species, as of many others, is at present unfortunately inaccessible for comparison, together with the rest of the collection formerly at the India House.

I cannot, however, coincide in the union of *R. erythroprocta*, Gould, with *R. rufiventris*. A pair of Mr. Gould's types in the British Museum, labelled from Erzeroum, have a rather shorter bill and tarsus than *R. rufiventris*, agreeing in this respect with *R. phœnicura;* and, in the male of *R. erythroprocta*, the black descends much farther on the breast than in *R. rufiventris*, the whole of the under wing coverts and axillaries being black in the former, whilst in the latter they are rufous, except the under coverts close to the edge of the wing. The distribution of the black colour is correctly stated by Mr. Gould in his original description of *R. erythroprocta* (P. Z. S. 1855, p. 78), and in the 'Birds of Asia.'

I was at first disposed to consider *R. semirufa*, Hemp. and Ehr. (Symb. Phys. Aves, fol. bb. and Tristram, Ibis, 1867, pp. 87, 88), identical with *R. rufiventris;* but after examining Messrs. Hemprich and Ehrenberg's types in the Berlin Museum, and a pair brought by Mr. Tristram from Mount Lebanon, and now in the British Museum, I am rather disposed to consider the Palestine bird a constantly smaller race. In colouration it precisely coincides with *R. rufiventris*, and like that form is distinguished from *R. erythroprocta* by its cinnamon coloured axillaries. I give the comparative measurements of three males and a female of *R. semirufa* in the Berlin Museum, and two males and two females of *R. rufiventris* collected by myself.

	Wing.	Tail.	Tarsus.	Culmen.
R. semirufa.				
1 ♂. Egypt	3.06	2.3	0.91	0.53
2 ♂. Lebanon	3.1	2.25	0.9	0.57
3 ♂. Syria	2.9	2.22	0.9	0.55
4 ♀. Syria	3.06	2.25	0.92	0.55
R. rufiventris.				
1 ♂. Karáchí, Sind	3.26	2.5	0.95	0.6
2 ♂. Ghistigán, Balúchistán	3.37	2.52	0.95	0.67
3 ♀. Near Bam, South-east Persia ..	3.16	2.4	0.92	0.55
4 ♀. Píshín, Balúchistán	3.1	2.4	0.95	0.61

It will be seen that the difference is very small. Jerdon gives considerably larger measurements for *R. rufiventris* : wing 3½, tail $2\frac{7}{10}$: and it is by no means improbable that the measurement of a large series from India would show that the specimens of *R. semirufa* are within the limits of variation of *R. rufiventris;* in which case the two should be united.

One of the specimens which I refer to *R. rufiventris*, the male bird from Píshín in Balúchistán, shot on February the 8th, presents the peculiarity of a narrow white frontal band above the usual black forehead, thus resembling *R. phœnicura*, except that the white band is usually much broader in that species. In other respects this specimen agrees with *R. rufiventris*, being a larger bird, with longer bill and tarsi than *R. phœnicura*, and having more black on the breast. I am disposed to look upon the white upper forehead as a mere individual variation; but the late Mr. Blyth informed me that he had seen similar specimens in India, and they may belong to a peculiar and undescribed race, or possibly be hybrids between *R. rufiventris* and *R. phœnicura*.

From the localities above quoted, as those at which specimens were collected, it will be seen that none were obtained on the Persian plateau, and hitherto there is no evidence, so far as I am aware, of the occurrence of *R. rufiventris* in Persia proper. It may traverse the country in spring and autumn and breed farther north, but neither De Filippi, Major St. John, nor I observed it, and its absence renders the isolation and distinctness of *R. semirufa* more probable.

106. **R. titys**, (Scop).

De Fil. Viag. in Persia, p. 276.
R. Cairii, Degl. Dict. Univ. d'Hist. Nat. 1848, xi, p. 259.

1 ♀. Khisht, north-east of Bushire .. 1800 .. January.

The only specimen obtained is in the plumage described as *R. Cairii*, and now shown to be that of the old female of *R. titys*.

I append a brief description of the skin: head and back greyish brown, the feathers of the former ash grey, of the latter black, except on the edges. Wings umber brown, smaller coverts blackish. Upper tail coverts and outer rectrices bright ferruginous, central rectrices dark brown, and external web of outermost tail feathers also brown, but paler. Sides of head and neck, throat, and breast black, with brownish edges to the feathers; these edges become broader further back and cause the black of the breast to pass gradually into pale earthy brown on the abdomen. Wing lining mixed black and pale brown. Wing 3.25 in., tail 2.25, tarsus 0.92, bill from forehead 0.48.

R. titys had not previously, so far as I know, been noticed south of the Elburz mountains. It was observed by Ménétries in the mountains of Tálish, near Lankorán, and by De Filippi on Demavend, near Tehrán, as recorded on p. 276 of his 'Viaggio in Persia,' although the species is omitted in the list of Persian birds at pp. 345–352.

107. **R. erythronota**, (Eversman).

Sylvia erythronota, Eversm. Addend. Pallas, Zoogr. Fasc. ii.
(?) *R. rufogularis*, Moore, P. Z. S. 1854, p. 27, Pl. LIV.—Horsf. and Moore, Cat. Birds Mus. E. I. Co. i, p. 306.

1 ♀. Shiráz, South Persia	5000	September.
2 ♀. Shiráz	5000	November.
3 ♂. Shiráz	5000	December.
4, 5, 6 ♂. Khisht, north-east of Bushire	1800	January.

I have identified this species with specimens thus named in several European collections. I cannot find a copy of Eversman's paper in London!

The series above specified was collected by Major St. John in the winter of 1870–71. I never saw this fine redstart, which appears to be only a winter visitant in Southern Persia, and probably breeds far to the north.

I think it highly probable that this redstart is the *R. rufogularis* of Moore. The original specimens described in the Proc. Zool. Soc. are no longer accessible; they form part of the East India Company's Museum; and the skins before me, although agreeing very fairly, do not exactly coincide with either the description or figure of *R. rufogularis*, so that although I believe this name to be a synonym of *R. erythronota*, I cannot be quite certain. In the description of *R. rufogularis*, that species is said to have the scapulars white, but I cannot help thinking it possible that this may be a slip or a misprint, for in the plate nothing of the kind is shown. In this figure, however, the deep rufous colouration of the breast is shown to terminate abruptly and not to pass gradually into the pale isabelline colour of the abdomen, as it does in both the Persian skins, and in two from Turkestán in Lord Walden's collection. But this again is very possibly a mistake of the draughtsman, due to the state of the specimen. It may even be an individual peculiarity, or seasonal, for all the skins to which I have access have been collected in winter. In a Persian specimen, shot in January, the rufous of the breast is much brighter, and there is a much sharper line of demarcation between it and the whitish abdomen than is the case in birds collected in the autumn, so that, on the whole, I attach very little importance to this apparent difference. The female in Moore's figure differs in no respect from the Shiráz birds. Moore's measurements are rather less than those of the Persian skins.

R. rufogularis has lately been rediscovered by Col. Delmé Radcliffe and Mr. Hume near Peshawur, where the bird is a regular winter visitant. (Ibis, 1870, p. 530.) Now as the species found in Southern Persia agrees perfectly with specimens in Lord Walden's and Mr. Dresser's collections from Turkestán, and the bird occurs in both localities in winter, it is hardly probable that the race which visits the Peshawur valley at the same season, and which is evidently very closely allied, should be different.

I add a description of the Shiráz specimens.

Male: head and nape pale ash grey, with a few black feathers above the nostrils and base of the bill, scarcely amounting to a distinct frontal band; back, throat, and breast deep ferruginous, rump a little paler, lateral rectrices the same, with a little brown near the ends of the external webs of the outer two pairs; central pair of rectrices dark brown throughout, except on the margin of the outer web, which is rufous; extreme chin, sides of the chin and neck, lores and ear coverts black. Quills hair brown with pale edges, coverts blackish brown, with a broad transverse white band formed by the median coverts and the greater coverts of the secondaries nearest the body. Abdomen, under tail coverts, and inner margins of the quills, pale isabelline; axillaries white at the ends, black towards the base, inner wing coverts mixed black and white. In specimens shot in September and December all the colours are less pure, the feathers of the crown have brown margins, and the red of the back and breast is much concealed by the brown margins of the feathers above and by isabelline edgings below. The black of the sides of the head and neck also is brownish.

Female: rather pale earthy brown above, rump and outer tail feathers ferruginous, the latter brownish at the ends, central rectrices dark brown, quills hair brown with pale edges, which are broadest and whitest on the last secondaries and the median coverts, forming an indistinct whitish bar on the wing. Sides of head and lower parts pale greyish brown, much paler than the back, and becoming whitish on the abdomen and lower tail coverts, the latter having a very slight rufous tinge. Measurements :—

	Wing.	Tail.	Tarsus.	Culmen.
♂	3.45	2.7	0.9	0.62
♂	3.42	2.75	0.9	0.6
♀	3.25	2.65	0.85	0.62
♀	3.36	2.8	0.92	0.62

In some specimens all the outer rectrices are brownish at the tips, the shafts being the darkest part, but this is not always the case.

R. erythrogastra, (Güld.) occurs both in the Caucasus to the north-west of Persia, and to the east in the Himalayas as far as Sikkim. It probably may be found in Persia, in the Northern parts at least.

108. **Cyanecula Suecica**, (L.)

Motacilla Suecica, Linn. Syst. Nat. edit. xii ; i, p. 336.—Blyth, Ibis, 1867, p. 17.

M. cærulecula, Pall. Zoogr. Ros. As. i, p. 480.—Gray, Handlist, i, p. 233.

1 ♂. Báhú Kalát, Balúchistán	—	..	Feb. 3.
2 ♂. Near Kalagán, Balúchistán	4000	..	March 19.
3 ♂. Bampúr, Balúchistán	2000	..	April 7.

All the specimens obtained had the rufous spot in the centre of the breast, like those from India and Sweden. I obtained no examples in Persia proper, and De Filippi records the occurrence of the white spotted species only. It is possible that both kinds occur, as they do, according to Tristram, in Palestine (Ibis, 1867, p. 86).

109. ? * **C. Wolfi**, Brehm.—De F.

C. Suecica, L. var. (*C. leucocyana*, Br.), De F. Viag. in Persia, p. 347.

De Filippi says that he obtained this species in the valley of the Lár, north-east of Tehrán in the Elburz mountains. It is highly probable that bluethroats breed in these mountains ; at the same time Dresser, in the 'Birds of Europe,' points out the probability of an immature specimen of *C. Suecica* having been mistaken for *C. Wolfi*. I could find no skin preserved by De Filippi in Turin.

110. **Daulias Hafizi**, (? Severtzov), Pl. X, fig. 2.—De F.

Ibis, 1874, p. 80.

Sylvia luscinia, Mén. Cat. Rais. p. 33.

Lusciola luscinia, De F. Viag. in Persia, p. 347.

(?) *Luscinia Hafizi*, Severtzov, Turkestanskie Jevotnie, p. 120.

1 ♂. Near Niríz, east of Shiráz, South Persia	5000	June 4.
2, 3 ♂, 4 ♀. Shiráz	4750	June 1.
5 ♂, 6 ♀. Shiráz	4750	June.
7 ♂. Shiráz	4750	(?)
8 (young). Isfahán	5000	July 10.

D. *ab peraffine* D. lusciniâ *v.* Lusciniâ verâ, *caudâ semipollice longiore atque magis rotundatâ distinguenda. Notæum vero plerumque minus rufum et gastræum pallidius quam in specie Europæâ, sed specimina quædam ex Persiâ allata, cum Europæis colore congruunt. Long. al. maris* 3.4–3.5, *feminæ* 3.25, *caudæ* ♂ 2.9–3.05, ♀ 2.87.

The Persian nightingale is certainly very closely allied to the common European bird; but the plumage is rather less rufous above and paler below, especially on the throat and breast, which have, as a rule, a grey tinge in the European nightingale Generally also the under tail coverts in the latter are isabelline, in the former white. Some Persian specimens, however, agree fairly in colour with their Western representatives, but the tail in the former appears always to be about half an inch longer and more rounded than in the latter. Of six male specimens obtained from different parts of Southern and Central Persia with perfect tails, none has the central rectrices, measured from the insertion to the tip, less than 2.9 inches, and nearly all are fully three inches long, whilst I can find no European specimen with the same feathers exceeding 2.5 inches in length. In the latter the tail is nearly square, whilst in the Persian bird the central rectrices are about a quarter of an inch to half an inch longer than the outer ones.

The difference in the Persian nightingale would scarcely have attracted my notice, but for the distinction in the song, which is certainly shorter and less varied than that of the European bird. Major St. John called my attention to this some years since, and I find that Mr. Blyth also has noticed the larger size and inferior song of caged Persian birds brought to Calcutta (Ibis, 1867, p. 18).

This nightingale is of course the true 'bulbul' of the East, and is as famous in Persian tales and poetry as is its representative throughout Europe. It abounds throughout the Persian highlands, keeping much to the avenues of Lombardy poplars and other trees which abound in the gardens around all towns and villages. At Karmán it was said by the people to be comparatively scarce, and we were begged not to shoot any; but around Shiráz, Isfahán, and Tehrán nightingales abound, and I rarely entered a well wooded garden without hearing their notes. I never heard or saw any further east than Karmán.

It is by no means improbable that the specimen in the Lucknow Museum, which Dr. Jerdon, according to Mr. Hume (Ibis, 1869, p. 356), recognized as *Philomela major* may belong to the present species; but the existence of a skin in Lucknow, even if the bird was skinned at the museum, proves nothing as to its origin, since it may have very possibly belonged to a caged specimen, like the Persian birds imported into Calcutta and mentioned by Mr. Blyth.

It is, however, certain that this race extends far into Central Asia north-east of Persia, for Mr. Meves of Stockholm, whom I met at Berlin, showed me a specimen obtained by Severtzov on the banks of the Syr Daria or Jaxartes river, in Turkestán. The measurement of this skin was: wing 3.45, tail 3.2, tarsus 1.1, culmen 0.68, the outer tail feathers 0.55 short of the central ones. It is this skin which enables me to identify this form with that described by Severtzov. The work of this author is entirely in Russian[1], and the number of well-known species described as new is so large that I doubt whether any of his names can be adopted without specimens to authenticate them. But the name of Hafiz, the great poet of Shiráz, seems singularly appropriate for the Persian nightingale; so I have retained it.

I should add that Mr. Meves told me he believed this bird to be the true *Muscicapa aëdon* of Pallas.

A still larger form than *D. Hafizi* has recently been described from Turkestán by Dr. Cabanis, under the name of *Luscinia Golzii* (Jour. f. Ornith. 1873, p. 79). I saw the type of this bird in Berlin. It measures: wing 3.8, tail 3.32, tarsus 1.15, and culmen 0.72 in.

The thrush nightingale, *D. philomela*, has also been received by Dr. Cabanis from Turkestán, (Jour. f. Ornith. l. c.), and it is recorded, though with doubt, by Ménétries as having been killed in October in the Caucasus. It may very probably be found in Northern Persia. It is possible too that some of the many *Ruticillinæ* or *Lusciniinæ*, characteristic of Central Asia, may occur within the limits of the Persian kingdom. Forms which may not improbably exist in North-eastern Persia are *Calliope Kamschatkensis*, (Gm.) and *Chimarrhornis leucocephala* (Vig.).

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[1] It is certainly a matter worthy of the consideration of naturalists whether descriptions in languages not usually understood, such as Russian, Czech, etc., should be recognised. *A priori* it appears that unless zoologists and botanists insist on Latin descriptions they are bound to accept them in any modern language, just as much as if they were in German, French, or English, but the practice of describing in little known tongues is very inconvenient.

111. **Sylvia Jerdoni**, Blyth.

(?) *S. crassirostris*, Rüpp. Zool. Atlas, p. 49, Pl. XXXIII, (1826).
S. orphea, var. *Helena*, Hemp. and Ehr. Symb. Phys. Aves, fol. cc.
S. Jerdoni, Blyth, J. A. S. B. 1847, xvi, p. 439.
Artamus cucullatus, Nicholson, P. Z. S. 1857, p. 195, Pl. XLII.
S. orphea, Jerdon, Birds of India, ii, p. 208, nec Tem.

1, 2 ♂, 3 ♀. Near Niríz, east of Shiráz, South Persia .. .. 7000 .. June 1.
4 young ♂. Abádeh, between Isfahán and Shiráz .. .. 6000 .. July.

The Eastern race of the Orphean warbler appears always to have a bill longer by about two-tenths of an inch than the European bird, and to be a little larger, although the differences in measurement are small. It is true that there is some variation in dimensions, especially in the Levant, where the two races appear to meet. Mr. Tristram (Ibis, 1867, p. 86) mentions shooting a pair in Palestine, the male of which belonged to the long-billed and the female to the short-billed type; and there is, I think, usually a slight sexual difference in the length of the bill, which is rather longer in the male. But, throughout Asia, east of Asia Minor, the long-billed form appears to be constant; no other, so far as I am aware, is ever met with in India, and all the specimens which I obtained in Persia are of the same type. It also prevails in North-eastern Africa, Arabia, and Asia Minor, although intermediate varieties are also found in these countries.

Admitting the claim of the Eastern race to a distinct specific title, I am somewhat in doubt as to the name to which it is entitled. If it be, as I am inclined to believe it is, the *S. crassirostris* of Rüppell, his name will have priority. I have examined Rüppell's type in the Frankfort Museum, and compared it with Indian specimens, and it agrees perfectly with females of *S. Jerdoni* in colouration and dimensions, but the bill is decidedly stouter and higher. There is at Frankfort but a single skin, which was procured by Rüppell in Sennaar, and until more specimens are obtained from that country, we must, I think, suspend our judgment as to whether the stouter bill is, as I suspect, an individual peculiarity, or whether it be characteristic of a distinct race. I may mention that the figure in Rüppell's 'Atlas' conveys an incorrect idea of the bird, being much too grey.

I have also examined Hemprich and Ehrenberg's types in the Berlin Museum, and they are certainly identical with the Eastern race. I especially mention this, because Professor Newton, in the new edition of Yarrell's 'History of British Birds,' appears to have been misled by Hemprich and Ehrenberg's very imperfect description into supposing the *Sylvia orphea*, var. *Helena*, of those naturalists distinct from *S. Jerdoni*, Blyth. It is not usual to consider a name applied in the same manner as *Helena* a specific name, and therefore that given by Blyth must be adopted.

The following measurements show the difference in the two races:—

Sylvia orphea, Tem.

	Wing.	Tail.	Tarsus.	Culmen.
1 ♂. Spain	3.05	2.65	0.95	0.55
2 ♀. Spain	2.95	2.5	0.9	0.5
3 ♂. Tangiers	3.1	2.55	0.91	0.49
S. Jerdoni, Blyth.				
1 ♂. Smyrna	3.2	2.68	0.9	(?)
2 ♂. Syria (type of *S. orphea*, var. *Helena*, H. and E. in Berlin Museum)	3.1	2.6	0.92	0.7
3 ♂. Arabia (type of the same in Berlin Museum)	3.18	2.67	1	0.74
4 ♂. Arabia (type of the same in Berlin Museum)	3.15	2.75	1.02	0.75
5 ♂. Niríz, South Persia	3.2	2.62	0.95	0.62
6 ♀. Niríz, South Persia	3.15	2.64	0.93	0.63
7 ♂. Karáchí, Sind	3.15	2.76	0.97	0.67
8 ♂. Kokánd, Turkestán..	3.2	2.7	0.95	0.67
9. Sennaar (type of *S. crassirostris*, Rüpp. in Frankfort Museum)	3.15	2.65	0.9	0.85

I only met with *S. Jerdoni* in Southern Persia and at a considerable elevation. It evidently breeds there. Neither De Filippi nor Ménétries record its occurrence in Northern Persia or the adjoining countries.

112. S. nisoria, Bechst.

1, 2 ♀. Shiráz	5000	Summer.

I did not myself meet with this species. The two specimens collected by Major St. John are paler and more rufous than usual, and the bars of the under surface are faint in one skin, having entirely disappeared from the throat and middle of the abdomen, and they are altogether wanting in the other. I have seen similar specimens from Southern Europe.

Shiráz appears to be the most eastern locality from which this bird has hitherto been recorded.

113. * S. salicaria, (L.)—De F.

Motacilla hortensis, Gmel.
Curruca hortensis, (Penn.), apud De Filippi, Viag. in Pers. p. 348.

Recorded by De Filippi as found by him in a garden at Tabriz, but no specimen is preserved in his collection at Turin. I did not meet with this species.

114. * S. atricapilla, (L.)—De F.

The blackcap does not appear to be common in Persia, and I did not myself meet with it, though Major St. John has twice obtained it. It was noticed by Ménétries in the forest at Lankorán on the Caspian, and by De Filippi at Delidián, just north of the Persian frontier, between Tiflis and Tabriz. Ménétries also met with it in the Caucasus.

[I shot a blackcap in the oak forest near Shiráz in 1864, and picked up a dead one in 1872 in the mission garden at Tehrán.—O. St. J.]

115. S. rufa, (Bodd.)—De F.

Sylvia cinerea, Latham.
Curruca cinerea, var. *Persica*, De Filippi, Viag. in Persia, pp. 162, 348.
S. affinis, Salvadori, Atti R. Acad. Sci. Tor. 1868, iii, p. 291, nec Blyth.

1 ♂. Near Niriz, east of Shiráz	7000	June 3.
2 ♂. Near Shiráz	5000	September.
3. Behzár, near Shiráz	?	—
4 ♂. Lura valley, Elburz mountains	6500	Aug. 8.

De Filippi, who observed the Persian whitethroat at Tabriz, where he found it breeding in gardens about the latter end of June, points out that it is rather smaller and less fulvous in colour than its European representative. He also considers the song of the Persian variety more melodious and silvery (*argentino*).

Specimens of *S. rufa* obtained in India by Mr. Hume (Ibis, 1871, p. 32) are said to differ slightly from English specimens, but the distinctions have not been pointed out.

The Persian specimens collected by me are distinguishable by no constant character from European birds, and they are precisely similar to two skins collected by De Filippi and preserved in the Turin Museum. They are paler below than European skins usually are, and rather more fulvous, with narrower edges to the secondaries and wing coverts; but some Western examples are precisely like Persian skins in this respect, and I can detect no constant difference in dimensions, although individuals vary. Salvadori (l. c.) identifies De Filippi's specimens with *S. affinis*, Blyth, but this is, I believe, another bird, allied not to *S. rufa*, but to *S. curruca*, q. v.

The whitethroat evidently breeds in Persia. It is more common in summer in the Northern part of the country than in the South. Ménétries noticed its occurrence at Lankorán, and I found it far from scarce in the Elburz mountains.

116. S. curruca, (L.)

Curruca garrula, Briss, etc.
S. affinis, Blyth, apud Hume, Stray Feathers, i, p. 197, partim.

1. Rás Malán, Makrán coast, Balúchistán	—	Nov. 27.
2 ♂, 3 ♀. Dasht river, west of Gwádar Balúchistán	—	Jan. 26.
4. Báhú Kalat, Balúchistán	—	Feb. 3.
5 ♂. Jálk, Balúchistán	3000	March 17.

I have only specimens of this bird from Balúchistán, collected in the winter months. At that time it abounded wherever bushes or trees were sufficiently thick to afford a suitable locality. It is equally common in many parts of India, avoiding thick forest jungles, and, of course, open plains. In Persia I did not observe it, and it has escaped the notice of Major St. John and De Filippi, but Ménétries met with it at Lankorán on the Caspian in May or June.

My specimens precisely resemble those from Europe both in colouration and dimensions. I did not meet with the little race called *S. minula* by Mr. Hume (Stray Feathers, l. c.), and the only specimen of a larger race is so distinct that I have placed it under a different name.

117. S. affinis? (Blyth.)

Curruca affinis, Blyth, J. A. S. B. xiv, 564, note.
(?) *Sylvia affinis*, Jerdon[1], Birds of India, ii, p. 209, partim.

1 ♂. Khán-i-surkh, south-west of Karmán,
South Persia . .. . 8500 .. May 22.

I obtained a single specimen of a *Sylvia*, differing from *S. curruca* both in size and colour. The wing is three-tenths of an inch longer, the bill considerably larger, and the upper plumage decidedly greyer and less brown. The lower parts have a very slight greyish tinge, different from the slight pink hue assumed by the lesser white-throat in spring, but the contrast is very trifling. There is also more white on the outer tail feathers. The following is a description.

Head above dusky ash passing gradually into ashy with a brownish tinge on the back, ear coverts dusky, wings and tail hair brown, the outermost tail feathers nearly all white, as is also the tip and a line running up the inner web along the shaft of the second on each side. Lower parts white with a very slight creamy tinge. Bill black, pale at the base below. Legs blackish (in the dried specimen), probably dark plumbeous in living birds, as in *S. curruca*. Wing 2.8 in., tail 2.18, tarsus 0.8, culmen 0.6, first primary 1.5 and second 0.2 shorter than the third, which is the longest, the fourth nearly equal, fifth a little shorter, sixth nearly the same as the second.

This specimen agrees pretty well with the description of Blyth's *Curruca affinis* (l. c.), which is said to have the wing $2\frac{3}{4}$ in. long, and the tarsus $\frac{13}{16}$ to $\frac{7}{8}$, with the general tone of colour darker than in *C. garrula* (*S. curruca*). Blyth says nothing of the colour of the tarsi, so it may fairly be inferred that they do not differ from those of the lesser whitethroat.

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[1] Jerdon describes the legs and bill as brown, and I am disposed to suspect that the species found by him in Southern India was not Mr. Blyth's *S. affinis*.

118. S. rubescens, W. Blanf. Pl. XII.

Ibis, 1874, p. 77.
(?) *Curruca cinerea*, Jerdon, Mad. Jour. Lit. and Sci. x, p. 268, nec Lath.
(?) *Sylvia affinis*, Jerdon, Birds of India, vol. ii, p. 209, partim.

1, 2 ♂, 3 young ♀. Shiráz	..	..	5000	..	June 12.
4 young ♂. Isfahán	.. ..	..	5000	..	July 10.

S. *inter* S. currucam *et* S. melanocephalam *fere media, ab illâ capite nigrescente, dorso saturatiore, tarsisque valde pallidioribus, ab hac coloribus omnino dilutioribus, pectore rubescenti-albo haud cinereo distinguenda.*

Male in June: head above with lores and sides of head including the feathers just beneath the eye dull black, becoming greyer on the nape, ear coverts dark ashy, mantle dark ashy with a very slight brownish tinge, quills brown, tail blackish brown, the outermost pair of tail feathers with the outer web and the terminal portion of each feather white, next two pairs less broadly tipped with white, the amount diminishing towards the middle, and in a newly-moulted specimen there is even a narrow white tip on the fourth feather from the outside. Lower parts white with a well marked pink tinge, especially on the breast, the white throat sharply defined at the edge, and not passing into the dusky cheeks. Bill dusky above, pale beneath, *legs brown.* Wing 2.38 to 2.45, tail 2.15 to 2.3, tarsus 0.75 to 0.8, culmen 0.5 to 0.53. First quill scarcely longer than the greater coverts, and 1.3 inches shorter than the third, which is the longest; second 0.1 shorter than the third, and equal to the sixth.

A specimen, of which the label has been lost, obtained by Major St. John, probably in Southern Persia, is apparently in autumnal plumage, having newly moulted. In this the colour is nearer to *S. curruca*, but still the anterior portion of the head is darker, the back, and especially the rump, greyer, and the tarsi much paler.

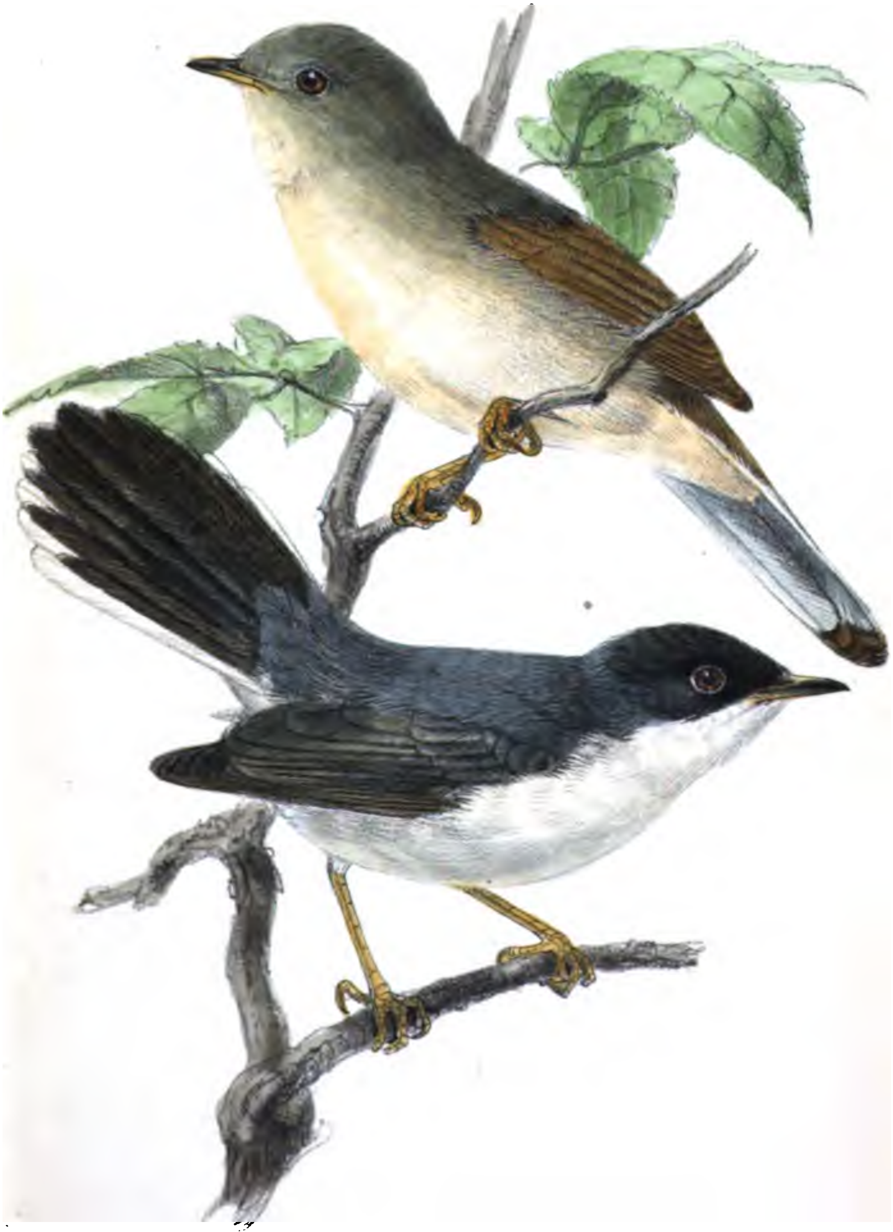
Young birds are brown above, the tail blackish, the white on the outer tail feather impure, the secondary quills with light brown edges, and the lower parts white with a tinge of buff.

This species is intermediate between *S. curruca* and *S. melanocephala.* It is distinguished from the former by its much darker back and blacker head, and by its tarsi and feet being brown instead of dark [illegible] about

[illegible] described

[illegible] and to be

[illegible] Jaxartes.



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SYLVIA RUBESCENS

Specimens in the British Museum received from Russia under the name of *S. Aralensis* are certainly *S. nana*, and so are skins in the Berlin Museum.

S. nana was found by the Marquis Doria to be common amongst low bushes in the salt desert near Yezd. I only once saw it in Southern Persia. This was on an open plain with low scattered bushes, near Yazdikhást; and I obtained it on two occasions in Balúchistán in rather thick tamarisk bush: the usual haunt throughout its extensive range, from Eastern Africa to North-western India, appears to be semi-desert plains with scattered bushes. Such was the original locality whence v. Heuglin obtained the types of *S. delicatula*, 'in dense salt-plant copses,' on the shores of the Red Sea, and the bird has been found in similar localities in several parts of North-western India, as near Delhi (Ibis, 1867, p. 29), Western Rájpútána (ib. 1869, p. 355), and Sind (Stray Feathers, i, p. 199). It hunts for insects about the bushes, and is sometimes seen on the ground at their roots. De Filippi, quoting Doria, says it always remains on the ground and raises its tail. Its general habits are somewhat *Drymœca*-like, as originally pointed out by v. Heuglin, and its flight very weak, much like that of the willow-wren. I did not notice its voice, which, however, has been observed by v. Heuglin and Hume to be feeble, resembling that of a *Drymœca*.

My notes on the colouration of the soft parts and the measurements agree very well also with the details given by v. Heuglin and Hume. The iris is golden yellow, bill dusky on the culmen, pale, almost flesh-coloured below, legs dull yellow. The following dimensions were taken on freshly shot birds :—

	♂ Dasht.	♀ Dasht.	♂ Yazdikhást.
Length	4·75	4·75	4·75
Expanse	7·25	7	7·25
Wing	2.1	2.25	2.4
Tail	2	1.92	1.8
Tarsus	0.8	0.75	0.85
Bill, from front	0.34	0.35	0.37
Bill, from gape	0.46	0.49	0.5
Closed wings short of end of tail by ..	1	1.1	1

120. * Sylvia conspicillata, Marm.

S. icterops, Mén. Cat. Rais. p. 34.

Found in the mountains of Tálish on the Persian frontier according to Ménétries, and probably to be met with in the Caspian provinces of Persia.

S. subalpina, Bon. (*S. mystacea*, Mén.), was obtained by Ménétries on the banks of the Kúr or Araxes river near Salián, west of the Caspian, and may also very probably occur in parts of Northern Persia.

121. **Phylloscopus**[1] **trochilus**, (L.)—De F.

1 ♀. West of Bam, south-eastern Persia	..	5500 ..	April 28.

The willow wren must be scarce in Persia, for this was the only specimen obtained. Probably a few winter in the southern part of the country, but breed beyond our limits to the north. *P. trochilus* is recorded by Ménétries from the Caucasus and Lankorán, and by De Filippi from the Lár valley near Tehrán; but I am not aware that it has been found farther to the east. The occurrence of this bird in India was asserted by Gould apparently upon insufficient authority, and although included by Jerdon in his 'Birds of India,' it is placed amongst the doubtful species in his appendix, and its existence in the country has never, so far as I know, been confirmed by any Indian ornithologist.

122. **P. tristis**, Blyth.

Blyth, J. A. S. B. xii, p. 96.
Phyllopneuste tristis, Gould, Birds of Asia, pt. xvii.

1 ♂. Dasht river, west of Gwádar, near Balúchistán	.. ..	— ..	Jan. 26.
2, 3 ♂. Kalagán, Balúchistán	.. ..	3500 ..	March 13.
4 ♂. Dizak, Balúchistán ..	.. ..	4000 ..	March 23.
5, 6 ♂. Bampúr, Balúchistán	.. ..	2000 ..	April 9.

This bird is common throughout Balúchistán, but I did not meet with it in Persia, perhaps because all the *Phylloscopi* migrate to the north before the season at which I reached the Persian highlands. I am inclined, however, to think that this bird may very probably not range farther west than Balúchistán, and be replaced in Persia by the closely allied European chiffchaff, *P. collybita*, Vieil. The two species are in some plumages very difficult to distinguish, but as a rule *P. rufus* is much greener above and more yellow beneath, the supercilia especially being as a rule yellow in *P. collybita*, buff or rufous in *P. tristis*, at all seasons. The shape of the wing is the same, and I cannot agree with Mr. Brooks (Ibis, 1870, p. 289) that the wings of *P. rufus* (i. e. *P. collybita*) are much shorter[1]; but, so far as I am able to judge from the specimens before me, the two species can always be distinguished, even in dried specimens (if they have not been bleached by exposure), by the much darker, blackish tarsi of *P. tristis*, contrasting strongly with the brown tarsi of *P. collybita*.

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[1] By many, perhaps by most modern ornithologists, the willow-wren and its allies are referred to a genus *Phyllopneuste* of Meyer. Professor Newton, in the new edition of Yarrell's British Birds, vol. i, p. 442, note, points out that no such genus ever existed. In Meyer's 'Vögel Liv- und Esthlands,' published in 1815, the species of the genus *Sylvia* were divided into five groups, or, as they were termed by Meyer, families, to which were applied respectively the names of *Curruca*, *Calamodytæ*, *Vermivoræ*, *Phyllopneustæ*, and *Troglodytæ*, but these names were in nowise employed as those of genera or subgenera. It follows that *Calamodyta*, Meyer, is equally incorrectly used instead of *Acrocephalus*, Naumann.

123. **P. collybita**[2], (Vieillot).

P. rufus, auct. nec *Motacilla rufa*, Bodd. nec *M. rufa*, Gmel.
P. brevirostris, Strickland.

1 ♂. Shiráz .. .. 5000 .. December.
? 2. Rás Masandim, Arabian coast, at the entrance to the Persian Gulf .. — .. Dec. 9.

There can, I think, be no question that the first specimen, that from Shiráz, is identical with the European species. The skin from Rás Masandim is less easy to determine, but it is greener above than most specimens of *P. tristis*, and the tarsi are browner than in that species.

If Mr. Tristram (Ann. and Mag. Nat. Hist. 1871, Ser. 4, viii, p. 28) is right in considering *P. brevirostris* as distinguished from the European chiffchaff by the rounder wings, the second primary in the former being shorter than the seventh, whereas in the latter the two are equal, the specimens from Persia and Arabia must be assigned to *P. brevirostris*. The difference, however, is so small, and the character assigned one so liable to variation, that I almost doubt if the distinction can be maintained[1].

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[1] The bird mentioned, l. c., under the name of *P. brevirostris* is evidently from the context *P. tristis*.

[2] For the reasons for employing this name instead of *P. rufus*, see Prof. A. Newton, in the fourth edition of Yarrell's History of British Birds, vol. i, p. 441.

124. P. Brehmi, (Hom.)

Phyllopneuste Brehmi, v. Homeyer, Erinnerungschrift, a. d. Samml. Deutsch. Ornith. 1870, p. 48.

1 ♀. Kalagán, Balúchistán	.. ..	3500 ..	March 10.
2 ♂. Near Dizak, Balúchistán	.. ..	4000 ..	March 25.
3. Shiráz, South Persia	.. .. ..	5000 ..	December.

This is little more than a small race of *P. tristis*, with which it agrees better in colouration than it does with *P. collybita*. It was described from Portugal, and evidently extends to the confines of India, where it should be looked for, as it may easily be mistaken for *P. tristis*. The wing, however, in *P. tristis* measures 2.35 to 2.45 inches, in *P. Brehmi* 2.1 to 2.2. The following are the measurements of the Persian and Balúchistán specimens, and of one from Turkey in Mr. Dresser's collection :—

	Wing.	Tail.	Tarsus.	Culmen.
♂. Dizak	2.15	1.65	0.72	0.48
♀. Kalagán	2.17	1.75	0.71	0.5
?. Shiráz	2.12	1.67	0.73	0.47
♀. Turkey	2.08	1.68	0.75	—

125. P. neglectus, Hume.

Ibis, 1870, p. 143 ; Stray Feathers, i, p. 195.

1 ♂. Píshín, Balúchistán ..	.. ..	600 ..	Feb. 10.
? 2. Shiráz, South Persia	.. ..	5000 ..	December.

I am in doubt about the second specimen, which is a young bird apparently, with the tail feathers only half grown. The Píshín specimen agrees excellently with Hume's description of his Sind birds in 'Stray Feathers;' but without this description it would have been impossible to have identified it, for in his brief notes on the species, given in the Ibis for 1870, l. c., where the bird was first named, as well as in Mr. Brooks's short notice (Ibis, 1869, p. 236) of what Mr. Hume considers the same species, the dimensions of the new *Phylloscopus* were said to 'closely resemble' or 'exactly resemble' those of *P. tristis*, which is a much larger bird than the form described from Sind, with a wing fully half-an-inch longer; and I cannot help suspecting that Mr. Brooks's specimen at least may prove to be something distinct. I doubt much whether the *Phylloscopus* described from the Sutlej valley in the Western Himalayas by Dr. Stoliczka, J. A. S. B. p. 46, can be the same. It is larger and the colouration more rufous.

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[1] Mr. Dresser tells me that he has compared the type of *P. brevirostris* with birds from Western Europe, and that he finds no difference between them.

As Mr. Hume's work, 'Stray Feathers,' from being published in India, may not be generally accessible, I add a description of my Píshín specimen. The colouration of the soft parts and the measurements were noted before skinning.

Upper parts earthy brown, rump and the edges of the wing and tail feathers rather paler, and the quills and rectrices themselves rather darker brown; a very narrow whitish superciliary line from the nostril above the eye; lower parts albescent with a brownish or fulvous tinge, wing lining, axillaries, and edge of wing the same, flanks pale earthy brown. According to Hume some specimens are rather more olivaceous or rufous than this. Iris brown, bill blackish, paler towards the base of the lower mandible, legs blackish dusky, soles pale, claws black; length 4.25 inches, expanse 6.3, wing 2, tail 1.55, closed wing short of the tail 0.75, tarsus 0.74, culmen 0.44, bill from gape 0.4, mid toe and claw 0.48. The central tail feathers exceed the outermost by 0.1, the first quill is 0.75 inches short of the second, the second about equal to the eighth and 0.2 short of the third, which is barely shorter than the fourth. The contents of the stomach consisted of small insects, and I shot the bird on an acacia, on which it was hunting amongst the branches.

This species is near my *P. pallidipes* from the Eastern Himalayas, (J. A. S. B. 1872, xli, pt. 2, p. 162), but it is much greyer and less olivaceous, has a less developed superciliary streak, and dark instead of light tarsi. The dimensions, however, do not much differ, as judging from the first notice of *P. neglectus* I supposed them to do.

126. * P. sibilatrix, (Bechst).

Sylvia sibilatrix, Bechst, Mén. Cat. Rais. p. 35.

Found by Ménétrics at Lankorán.

127. Hypolais languida, (H. and E.)

Curruca languida, Hemp. et Ehr. Sym. Phys. Aves, fol. bb.
Hippolais Upcheri, Tristram, P. Z. S. 1864, p. 438.—Ibis, 1867, pp. 81, 82.

Hypolais languida, W. Blanf. Geol. and Zool. Abyss. p. 379.—Heugl. Ornith. N. O. Afr. i, p. 296.—Dresser, Birds of Europe, pt. xxviii.

1 ♂. Magas, between Dizak and Bampúr, Balúchistán	4200 ..	March 28.
2 ♂. Near Rígán, Narmashír, south-eastern Persia	3000 ..	April 15.
3 ♂. Narmashír	2500 ..	April 18.
4 ♂. Narmashír	3000 ..	April 19.
5 ♀. West of Bam, south-eastern Persia ..	4000 ..	April 23.
6 ♀. Parpá, 130 miles east of Shiráz ..	5500 ..	May 31.
7 ♂. Near Niríz, east of Shiráz	5000 ..	June 3.
8 ♂, 9 ♀. Near Niríz, east of Shiráz ..	5000 ..	June 5.

This species appears to be very rare in European collections. I obtained a single specimen on the Abyssinian coast land in 1868, and compared it with the original type in the Berlin Museum. I have compared the birds obtained in Persia with the same type, with the Abyssinian specimen, and also with Mr. Tristram's types of *H. Upcheri*, which he kindly sent to me for the purpose [1], and I have no hesitation in referring all to the same species, a well marked form intermediate (as Mr. Tristram pointed out when describing *H. Upcheri*) between *H. eælica* (*pallida*) and *H. olivetorum*, both in size and in the character of the first primary.

There is but little variation in size in the different specimens; females are rather smaller than males, but the difference is very trifling. The length of the first primary varies; in some birds it is decidedly shorter than the wing coverts, as short even as in *A. olivetorum*, in others it is rather longer than the coverts, varying in length from about one-third to half-an-inch, but it is always shorter and more pointed than in *H. pallida*. The third or fourth quill is the longest, the second nearly the same as the sixth. The colour is nearly the same in all the specimens I have seen; dull earthy brown above, white with a slight grey or fulvous tinge below, the lores pale, and a very short whitish superciliary stripe. In freshly moulted specimens all the outer rectrices have narrow white tips, broadest on the outermost pair, of which the margin of the outer web is also whitish. The iris is umber brown; the bill dusky above, yellow along the commissure, and yellowish or flesh-coloured below; legs brown, feet sometimes with an olivaceous tinge, claws horny. The following are measurements of a male (No. 1) and female (No. 6) taken before skinning:—

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[1] I may mention that a specimen in the British Museum marked *H. Upcheri*, and collected by Mr. Tristram, belongs, in my opinion, to *H. pallida*, v. *elæica*.

	♂ Magas. In.	♀ Parpá. In.
Length	6.25	6.3
Wing	3.13	3.05
Expanse	9	9
Tail	2.45	2.45
Tarsus	0.88	0.92
Bill from gape	0.76	0.8
Wings short of end of tail	1.1	1.4
Central tail feathers exceeding outer by	0.25	—

The bill along the culmen measures 0.72 to 0.77, the wing 2.95 to 3.15 in the different specimens from Persia. With the above the following measurements of the type of *H. languida* in the Berlin Museum, and of Mr. Tristram's type specimens of *H. Upcheri*, may be compared:—

	Wing.	Tail.	Tarsus.	Culmen.
1 (type of *H. languida*). Syria	2.95	2.43	0.92	—[1]
2 (type of *H. Upcheri*) ♂. Hasbeiya, Palestine ..	2.9	2.35	0.85	0.76
3 (type of *H. Upcheri*) ♀. Foot of Mount Hermon	2.8	2.33	0.93	0.76

Of the female obtained at Parpá on May the 31st I took the nest and three well incubated eggs. The nest was in a small bush in a plain on which shrubs and low bushes were rather thickly sprinkled over the ground. At the foot of the same bush was a nest of *Saxicola deserti*. The *Hypolais* nest consists of a very neat cup of grass mixed with spider webs and the down of some plant. The eggs are pinkish white, with small scattered spots and irregular streaks of chocolate brown, and measure 0.76 by 0.53.

This bird is far from rare in Southern Persia and the higher parts of Balúchistán, being found indifferently in gardens, in wooded ravines, and in bushes on comparatively open plains. It is less abundant than *H. rama*, except in the more open and semi-desert country, in which the latter was never observed.

128. H. opaca, Cab.

Licht. apud Cab. Mus. Hein. i, p. 36.
Hippolais pallida, Z. Gerbe, Rev. et Mag. de Zool. Ser. 2, iv, p. 174, nec Hemp. et Ehr.—Degland et Gerbe, Ornith. Europ. i, p. 506.

1 ♂. Shiráz .. .. 5000 .. December.

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[1] I have only noted the length of the bill at front, but the bill was compared carefully with that of Persian specimens, and found exactly similar.

This is very closely allied to the last, but may be readily distinguished by its much larger and longer first or bastard primary. In the specimen before me this feather projects between 0.6 and 0.7 inches beyond the small feathers at the bend of the wing, and its extremity is only 1.42 inches short of the second or first long primary, whilst the difference in length between these two in *H. languida* is 1.55 to 1.72. The colouration of the bird which I refer to *H. opaca* is a little more fulvous above, on the rump and upper tail coverts especially, than is that of *H. languida,* and the abdomen and lower tail coverts have a more distinctly brownish tinge in the former, but these differences may be due to the specimen having been shot in winter. It is precisely similar both in structure and colour to skins from Spain (the original locality of *H. pallida*, Gerbe) in Mr. Dresser's collection.

From *H. pallida* (*H.* and *E.*) the bird in question is solely distinguished by its larger size, but the difference is considerable, as will be seen by comparing the dimensions. It is true that *H. pallida,* as I shall presently show, is variable in this respect.

I have only one reason for doubt in assigning the specimen obtained at Shiráz to *H. opaca*, Cab. Gerbe described his species as having short under tail coverts only three-fifths of the length of the rectrices, and as having the second primary shorter than the sixth and scarcely equal to the seventh, whereas in my specimen the second primary exceeds the sixth, and the under tail coverts are more than half the length of the tail. But I find that specimens of *H. opaca* from Spain in Mr. Dresser's collection, agreeing well in other respects with Gerbe's description, have under tail coverts of the same length as the Shiráz bird, and the proportion of the quills varies too much in allied forms for the exact relative lengths of the second and sixth primaries to be a character of specific value.

From the only specimen of this species obtained in Persia having been shot in winter, at an elevation of 5000 feet, it is probable that this is a more northern form than *H. languida* and *H. rama.* The dimensions of the specimen are, wing 3 inches, tail 2.45, tarsus, 0.95, first primary 1.42 short of the second, and the latter 0.15 short of the third, which is a little longer than the fourth.

129. **H. rama**, (Sykes[1]).

Sylvia rama, Sykes, P. Z. S. 1832, p. 89.
Phyllopneuste rama, Jerdon, Birds of India, ii, p. 189.—Blyth, Ibis, 1867, p. 24.—Hume, Ibis, 1867, p. 471.
Iduna caligata, G. R. Gray, Handlist, i, p. 209, partim.

130. **H. pallida**, (H. and E.)—De F.

Curruca pallida, Hemp. et Ehr. Symb. Phys. Aves, fol. bb (1828).
Salicaria elaica, Lindermayer, Isis, 1843, p. 342.
Ficedula elaica, De F. Viag. in Persia, p. 348.
Hypolais elaica, Tristram, Ibis, 1867, pp. 74, 81.
Acrocephalus pallidus, v. Heugl. Ornith. N. O. Afr. p. 294.
Hypolais elaica, Finsch, Tr. Z. S. vii, pp. 232, 315, partim.
Chloropeta elaica, Gray, Handlist, i, p. 214.
Hypolais pallida, Dresser, Birds of Europe, pt. xxxi.

The following list of specimens includes both races and the intermediate varieties. The latter predominate.

1, 2, 3 ♂, 4 ♀. Dizak, Balúchistán	4000	March 22, 24.
5, 6, 7, 8 ♂. Bampúr, Balúchistán	2000	April 3–7.
9, 10, 11, 12 ♂. North-west of Bampúr	1600	April 10–11.
13 ♀. Rígán, Narmashír, south-eastern Persia	2500	April 18.
14 ♂. West of Bam, south-eastern Persia	5500	April 28.
15 ♂. Ráyín, east-south-east of Karmán, south-eastern Persia	7000	May 1.
16, 17, 18 ♂, 19, 20 ♀. Sarján, south-west of Karmán	5700	May 25–28.
21, 22 ♂. Niríz, east of Shiráz, southern Persia	5300	June 2.
23, 24 ♂, 25 ♀. Salt lake, near Shiráz	4500	June.
26, 27 ♂. Shiráz	4700	June 5.
28, 29 ♂, 30 ♀. Shiráz	4700	June.
31 ♂, 32 ♀. Shiráz	4700	August.
33 ♀. Shiráz	4700	December.
34, 35, 36, 37 ♂. Isfahán	5000	July 10.
38 ♂. Lura valley, Elburz mountains, north Persia	6500	August 9.

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[1] There appears to be much doubt as to whether the larger or smaller Indian species is the true *Sylvia rama* of Sykes. The type in the Indian Museum is not available for comparison at present, but if, as some ornithologists think, and as is by no means improbable, Sykes's type prove to belong to the smaller race, (*Sylvia caligata*, Licht. v. *Jerdonia agricolensis*, Hume,) the larger form, which is undoubtedly the *Phyllopneuste rama* of Jerdon, will be without a specific title. It is this larger form alone which is found in Persia.

I was at first disposed to unite the above two forms and to add to them Mr. Hume's *Jerdonia agricolensis*, and I published this opinion in the Ibis for 1874, page 78; but there appear to be as good grounds for keeping all three distinct as there are in the cases of *Sylvia Jerdoni* and *S. orphea*, *Aedon galactodes* and *A. familiaris*, etc. Still *Hypolais rama* and *H. pallida* pass into each other so completely in Persia that I cannot possibly say to which the majority of the large series collected should be referred. As a rule the birds from Balúchistán and Southern Persia agree rather with the Indian *H. rama*, those from Eastern and North-eastern Persia with the European *H. pallida*, but there are many exceptions. I should point out in the first place that the European and North-east African bird (*H. pallida*) is rather larger, with a longer and decidedly broader bill, the wing measuring usually about 2.5 inches (2.4 to 2.65 in thirteen specimens measured), culmen about 0.7, whilst in the Indian *H. rama* the wing measures about 2.4 inches (2.34 to 2.45 in seven specimens), culmen about 0.62, that *H. pallida* is somewhat greyer in colour, and that it has a darker tarsus (in dried specimens at all events) and a more pointed wing, the primaries projecting farther beyond the end of the secondaries. The difference in colour I suspect to be seasonal, European birds having been chiefly collected in the spring and summer, Indian specimens mostly in winter; the difference in the colour of the tarsus in dried specimens is possibly due to the stronger light to which Indian skins have been exposed when being dried; and the dimensions certainly vary in both to a considerable extent, as will be seen from the measurements to be given presently. But *H. pallida* has always a broader bill than *H. rama*, and there is a decided difference in the eggs of the two forms.

The nest and eggs of *Hypolais pallida* (*H. elæica*) are well known. Mr. Tristram describes the nest as a 'neat compact structure, of a deep cup shape, its depth equalling its diameter, formed of fine grass and strips of bark, and tightly lined with thistle-down and vegetable cotton.' The eggs are 'four or five in number, of salmon-tinted white ground, with purplish spots and streaks' (Ibis 1867, p. 82). On the other hand, Mr. Hume (Ibis, 1867, p. 471), described a nest of *Hypolais* (*Phyllopneuste*) *rama* as 'nearly egg-shaped, with a circular entrance near the top. It was loosely woven with coarse and fine grass, and a little of the "sun"[1] (*Crotalaria juncea*), and very neatly felted on the whole interior surface of the lower two thirds with a compact coating of the down of flowering grasses, and little bits of spider's web. It was already five inches in its longest and three inches and a half in its shortest diameter. It contained three fresh eggs, which were white, very thickly speckled with brownish pink, in places confluent and having a decided tendency to form a zone near the large end.'

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[1] A fibre much resembling hemp, and used for similar purposes.

In Persia I took but one nest, which agreed on the whole with Mr. Tristram's description; it was, however, loosely, not compactly woven, of coarse grass and vegetable fibres, with fragments of cloth and string, and lined with hair and a few feathers. The whole was cup-shaped, open at the top, and situated about three feet from the ground in the fork of a small pomegranate tree, standing in a garden close to a village. This nest contained five eggs, well incubated, pinkish white in colour, irregularly spotted and streaked with chocolate brown, more thickly towards the larger end, but without any tendency to confluence in the spots, or to the formation of a zone, and measuring 0.67 by 0.51. I observed the bird on the nest for some time before shooting it. This bird and others shot at the same spot, a village named Tarabád in the district of Sarján, between Karmán and Shiráz, agreed in dimensions with *H. rama,* whilst the bills of some of the birds resembled those of the European *H. pallida,* and others were undistinguishable from those of the Indian form. The particular specimen to which the nest belonged was intermediate in this respect. I took its dimensions before skinning, and they were—length 5.4 inches, expanse 7.5, wing 2.42, tail 2.05, tarsus 0.78, bill from forehead 0.47, from the gape 0.62, wings from the end of the tail 1.3.

If the nest described by Mr. Hume be really the usual form of that produced by *H. rama,* not only does that differ altogether in its nidification from *H. pallida,* but from all other species of *Hypolais.* I think we should have more evidence before we can conclude that the Indian bird, which is absolutely undistinguishable from some of my Balúchistán specimens, makes normally an egg-shaped nest with the entrance *near* the top (that is, I suppose, at the side, as in *Drymœca*). Mr. Dresser has carefully compared the eggs obtained by me in Southern Persia with a series of *H. pallida,* and finds that the former are smaller and differently marked. The bird which laid them, although much closer in all its characters to *H. rama* than to *H. pallida,* had the bill slightly intermediate in form.

On the whole it appears to me best to keep these European and Indian forms distinct, and to consider the intermediate forms from Persia as hybrids. The union of *H. pallida* (or rather of *H. elæica*) with *H. rama* was first proposed, I think, by Mr. Blyth (Ibis, 1867, p. 24), and again suggested by Dr. Finsch (Tr. Z. S. vii, p. 315). Mr. Tristram, on the other hand (Ibis, 1870, p. 494), pointed out their distinctness.

The type specimens of *Curruca pallida*, Hemp. and Ehr., in the Berlin Museum, are from Egypt and Nubia, and whilst some agree perfectly with the European form or *H. elæica,* others are somewhat intermediate in size between it and *H. rama.*

After examining the type specimen of Lichtenstein's *Sylvia caligata,* also in the Berlin Museum, I came to the same conclusion as Mr. G. R. Gray in his 'Handlist of Birds,' and Mr. Tristram (Ibis, 1870, p. 493), that that species is identical with *Sylvia rama,* a view first suggested, I think, by Mr. Blyth (Ibis, 1867, p. 24). There is but a single specimen, and this differs from *Hypolais rama* in the form of the bill, which rather resembles that of a *Phylloscopus*; but after carefully examining the bird, I am satisfied that this must be due either to alteration of the form by lateral compression, or else that it is an individual peculiarity, the skin in every other respect agreeing with *Hypolais rama.* Mr. Dresser, however, who also examined the type of *S. caligata,* whilst coming to the same conclusion as myself with respect to the bill, considered the specimen identical with the smaller Indian form, called *Jerdonia agricolensis* by Mr. Hume (Ibis, 1870, p. 182). On hearing the conclusion to which I had come, Mr. Dresser obtained the loan of the skin from the Berlin Museum, and recompared it carefully with a large series of Indian specimens, with the result of convincing himself that he was correct. I can only bow to his decision. I attached but little value to the distinctions between the larger and smaller Indian forms when I compared the specimen at Berlin, and may not have made a sufficiently careful comparison. I should add that I have seen other forms sent from various museums and labelled *Sylvia caligata,* one of them, a Central Asian skin, being an unmistakable specimen of *Acrocephalus agricolus,* Jerdon.

As I have already stated, I was at one time disposed to unite to *H. rama* the small form called *Jerdonia agricolensis*[1] by Mr. Hume (*H. caligata*).

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[1] The following appears to be the synonymy of this species :—

Motacilla salicaria, Pall. Zoogr. Ros. As. i, p. 492, nec Linn. (1811).

Sylvia caligata, Licht., Eversman's Reise von Orenburg nach Buchara, p. 128, (1823).

So far as an examination of skins can show, there appears a complete passage from it into *H. rama*. But it is said to differ in habits, voice, etc., besides being constantly smaller; and although I cannot admit that there are any grounds for generic distinction, I do not think it probable that Mr. Brooks and Mr. Hume can have been mistaken on a subject which they have so carefuly studied as the constancy of the distinctions between the larger and smaller forms of the Indian *Hypolais*. I may add that if naturalists insist on separating these birds from *Hypolais*, the genus *Iduna* was proposed by Keyserling and Blasius for this very species *Sylvia caligata*. I cannot myself see that the length of the bastard primary, the only distinction known, is of generic importance, but others may think differently. It should be borne in mind that *H. caligata* has a considerable range outside of India, the type having been collected by Eversman between Orenburg and Bokhara, whilst Herr Meves, of Stockholm, showed me several specimens collected by him in the Ural mountains. Herr Meves did not meet with the larger *H. rama* in the Ural, nor has it, so far as I know, been found in Central Asia.

The following series of measurements will serve to show how complete is the gradation between *Hypolais pallida*, *H. rama* and *H. caligata* :—

1. European, Syrian, and African specimens (*H. pallida* v. *elæica*)[1].

	Wing.	Tail.	Tarsus.	Culmen.
1 ♀. Smyrna (Mus. Dresser)	2.65	2.02	0.87	0.7
2 ♂. Smyrna (Mus. Dresser)	2.6	2.1	0.85	0.7

Iduna caligata, Keyserling und Blasius, Wirbelth. Eur. pp. lviii, 190, (1841).—Gray, Handlist, i, p. 209, partim.

Sylvia scita, Eversman, Jour. f. Ornith. 1853, p. 286.

Jerdonia agricolensis, Hume, Ibis, 1870, p. 182.

Eversman himself has stated (Jour. f. Ornith. 1853, p. 285) that the type of *S. scita* is the same as that named *S. caligata* by Lichtenstein. I may add that Herr Meves confirmed the reference in Gray's 'Handlist' of *Motacilla salicaria* of Pallas to *Sylvia caligata*; at least he assured me that the form known to Russian naturalists as *salicaria* is identical. Pallas's name, however, cannot stand for the species, as it is not the *Motacilla salicaria* of Linnæus (*Sylvia hortensis*, auct.)

[1] Measurements much exceeding those here given are quoted by Finsch, Tr. Z. S. vii, p. 232, as those of specimens of *H. elæica*, from the Abyssinian coast. In one skin the wing measured no less than 3.03 inches (2 inches 10 lines, the inches and lines being the old French ones, which are larger than the corresponding English measures of length). I examined the original specimens at the time, and I am disposed to think that some of the birds belonged to *H. languida*.

	Wing.	Tail.	Tarsus.	Culmen.
3. Egypt (Mus. Dresser)	2.6	2.03	0.85	0.72
4 ♂. Attica (Mus. Dresser)	2.54	1.97	0.88	0.72
5 ♂. Palestine (Mus. Dresser)	2.46	1.92	0.85	0.7
6. Syria (Mus. Dresser)	2.5	1.95	0.83	0.68
7. Syria (Mus. Dresser)	2.45	1.99	—	0.7
8. Nubia (Berlin Mus. type of *C. pallida*, H. and E.)	2.47	1.82	0.82	—
9. Nubia (Berlin Mus. ditto)	2.55	2.06	0.87	—
10.[1] Nubia (Berlin Mus. ditto)	2.4	1.9	0.85	—
11. Egypt (Berlin Mus. ditto)	2.6	2.02	0.88	—
12. Upper Egypt (Berlin Mus. ditto)	2.43	2.03	0.83	—
2. Persian Specimens.				
1 ♂. Shiráz	2.76	2.1	0.87	0.67
2 ♂. Shiráz	2.7	2.1	0.85	0.68
3 ♂. Bampúr, Balúchistán	2.7	2.07	—	0.68
4 ♂. Bampúr	2.67	2.11	0.88	0.7
5 ♀. Rígán, Narmashír, south-eastern Persia	2.6	2	0.82	0.62
6 ♂. Lura valley, Elburz mountains, north Persia	2.5	1.97	0.84	0.61
7 ♂. Bampúr	2.48	2.03	0.85	0.65
8 ♀. Dizak, Balúchistán	2.48	2.18	0.77	0.62
9 ♂. Isfahán	2.45	2.1	0.86	0.65
10 ♂. Shiráz	2.41	2.14	0.82	0.6
11 ♂. Sarján, south-west of Karmán	2.43	2.08	0.8	0.62
12 ♀.[2] Sarján, south-west of Karmán	2.43	2.08	0.78	0.62
13 ♂. Near Bam, south-eastern Persia	2.43	2.08	0.85	0.64
14 ♂. Bampúr	2.42	2.08	0.83	0.64
15 ♂. Dizak	2.4	2.08	0.81	0.6
16 ♀. Sarján	2.33	2	0.8	0.65
3. Indian Specimens.				
a. *Hypolais rama.*				
1 ♂. Etawah, North-west Provinces (Mus. Dresser)	2.45	2.1	0.83	0.68
2 ♀. Etawah (Mus. Dresser)	2.43	2.2	0.84	0.62
3 ♂. Karáchí, Sind (W. T. B.)	2.4	1.92	0.81	0.62
4 ♂. Cawnpore, North-west Provinces (Mus. Dresser)	2.34	1.96	0.88	0.64
5 ♂. Loc ? (Mus. Dresser)	2.35	2.08	0.83	0.62
6 ♂. Berar (W. T. B.)	2.38	2.05	0.83	0.62
7 ♀. Godávari valley, near Ellore (W. T. B.)	2.36	2	0.85	0.57
b. *H. caligata* (*Jerdonia agricolensis*).				
8 ♂.[3] Etawah (Mus. Dresser)	2.4	1.87	0.84	0.55
9 ♀. Berar (W. T. B.)	2.35	1.9	0.8	0.54
10. Chánda, Central Provinces (W. T. B.)	2.33	1.95	0.8	0.5
11. Biláspúr, Central Provinces (W. T. B.)	2.32	1.83	0.8	0.53

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[1] Probably a young specimen, it bears a MS. name of Ehrenberg's.

[2] This is the specimen of which the nest and eggs were taken.

[3] This is a typical specimen from the original locality, sent to Mr. Dresser by Mr. Brooks.

	Wing.	Tail.	Tarsus.	Culmen.
In the type of *Sylvia caligata*, Licht., the measurements are	2.42	1.97	0.82	—

To the above list it should be added that, generally speaking, the shorter bills are narrower in proportion at the base than the larger ones, and there is precisely the same variation in this respect as in the other dimensions.

It may be noticed that some of the largest of the Persian specimens are from Bampúr in Balúchistán, and that these agree precisely in every respect with European examples of *H. pallida*, whilst the birds from Isfahán agree equally well, both in dimensions and structure, with *H. rama* from India, so that there is not anything like a complete passage from the larger to the smaller form in going from east to west.

From various notes taken from freshly-shot specimens I find the total length varies from 5.3 to 5.75 inches, expanse 7.5 to 8.25, bill from the gape 0.61 to 0.65, or perhaps rather more, and the distance by which the closed wings are short of the end of the tail 1 to 1.3 in. The first or bastard primary usually projects 0.6 in. beyond the small feathers of the wing lining; sometimes it is only 0.5, and I have one specimen from Shiráz in which it measures no less than 0.75; the second (or first long) primary is from 0.2 to 0.35 (usually about 0.25) shorter than the third, which in most cases slightly exceeds the fourth, but there are exceptions; the second is usually about equal to the sixth, in extreme cases it may be as long as the fifth or as short as the seventh. The iris is umber brown, bill dark horny above, flesh-coloured below, legs brown, the feet with an olive tinge.

Either *Hypolais pallida* or *H. rama* abounds throughout Persia, being especially common in gardens, in which, in the spring, its monotonous call may be constantly heard. It is far more of a garden bird than *H. languida*. At Bampúr in Balúchistán I met with it in thick bushes on the banks of a stream. It breeds in Southern Persia in May.

Acrocephalus dumetorum, Blyth, (*Salicaria magnirostris*, Liljeborg), which, from its habits, I suspect of being a *Hypolais*, has been found both in India and Eastern Europe, Mr. Dresser having obtained specimens of it from the Volga. It probably occurs in Persia. *H. olivetorum* has not hitherto been met with so far to the eastward.

131. Acrocephalus[1] stentoreus, (Hemp. and Ehr.)

Curruca stentorea, H. et E. Symb. Phys. Aves, fol. bb.
Agrobates brunnescens, Jerdon, Madras Jour. Lit. and Sci. x, p. 269.
Acrocephalus brunnescens, Jerdon, Birds of India, ii, p. 154.
A. stentoreus, Allen, Ibis, 1864, p. 97, Pl. I.—Shelley, Birds of Egypt, p. 95.

1 ♂. Bampúr, Balúchistán	2000 ..	April 7.
2 ♂. Shiraz lake, south Persia	4700 ..	June 8.
3 ♂. Shiráz	4750 ..	July 6.
4, 5 ♂, 6 ♀. Shiráz	4750 ..	July.
7 ♂. Shiráz	4750 ..	September.
8 ♂. Asupás, between Shiráz and Isfahán..	7000 ..	June 26.

An examination of Hemprich and Ehrenberg's types has confirmed what I had previously ascertained from other data, viz. that their *Curruca stentoria* is identical with the well known Indian *Acrocephalus brunnescens*, Jerdon. In the figure of *A. stentoreus*, published in the Ibis, l. c., the breast is shown to be striated; but this character is not constant, for it is not seen in the types in the Berlin Museum, nor in a specimen in Mr. Howard Saunders's collection. On the other hand, there is in the same collection a skin from Turkestán in which these striæ are well marked, and, to complete the evidence, Mr. Saunders showed me examples of *A. arundinaceus* from Spain similarly striated, and expressed his conviction that these marks are occasionally developed in the breeding plumage in both species.

The loud harsh note, from which *A. stentoreus* derives its name, is familiar to most Indian ornithologists, and I repeatedly heard it in Persia.

The Egyptian, Persian, and Indian birds, which I refer to the present species, differ from the European *A. arundinaceus*, (L.) in having a shorter and much more rounded wing, the second (first long) primary being always shorter than the third and fourth, and generally than the fifth, whilst the longest primaries project much less beyond the secondaries than in *A. arundinaceus*, in which the second primary nearly or quite equals the third in length, and is always longer than the fourth. The two birds otherwise do not differ in structure or dimensions, and there is no constant distinction in colour. *A. arundi-*

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[1] For the reason for using this generic name instead of *Calamodyta*, see Newton's edition of Yarrell's British Birds, i, p. 368. See also the note under *Phylloscopus trochilus* in this volume, p. 180.

naceus is usually more fulvous on the underparts, and especially on the lower wing coverts, but this is not always the case.

I had so few opportunities of collecting marsh and reed birds in Balúchistán and Persia that I obtained only a small number, and even of the commonest species I was able to note but few localities. *Acrocephalus stentoreus* was rather scarce at Bampúr in Balúchistán early in April in reeds by a stream, but it abounded in June near the lake of Shiráz, and in the great marsh of Asupás, north of Shiráz. It breeds evidently in both these localities, but probably leaves the Persian highlands in winter. Its loud monotonous note was frequently heard near Shiráz.

I cannot say whether this bird extends into Northern Persia; probably it does, for De Filippi mentions (Viag. in Pers. p. 162) a bird closely resembling *A. arundinaceus*, which he noticed in a garden at Tabriz, but which he considers different from the large European reed warbler because of its louder voice, more yellow colour below, and also because of the dry locality in which he saw it. The first character certainly appears to indicate *A. stentoreus*, which is sometimes seen in gardens and similar places, but which is not more fulvous beneath than its European representative. Still it is not easy to conceive what other bird could have so closely resembled *A. arundinaceus*.

The dimensions of the specimens of *A. stentoreus* collected by me in Persia were—Males, wing 3.2 to 3.4; tail 2.75 to 3.2; tarsus 1.05 to 1.17; culmen 0.9 to 1.05. The only female specimen I have is evidently a young bird. The above measurements agree with those of Indian specimens. There is a skin from Egypt in Mr. Howard Saunders's collection with the wing only 3.1 in. long, but other Egyptian birds are larger. On the other hand, the wing of a Turkestán specimen in the same collection measures no less than 3.7 in.

In my notes on the soft parts I find the iris marked as pale umber brown, legs pale olive or horny, soles of the feet greenish white, claws horny, bill dusky above, flesh-coloured near the base below, deep yellow inside.

132. * ? A. arundinaceus, (L.)

Sylvia turdoides, Meyer, Mén. Cat. Rais. p. 32.

This is said to have been obtained by Ménétries in the mountains of Tálish, and in reeds near Lankorán on the Caspian, and is probably found in Ghilán and Mazandarán. A specimen from Astrakhán on the Volga, in Mr. Dresser's collection, belongs to the European form of large reed warbler, and I think there is every probability that Ménétries' species was rightly identified, and that the present bird replaces *A. stentoreus* in Northern Persia and around the Caspian. Still it is possible that the Lankorán species may be *A. stentoreus.*

133. A. streperus, (Vieill.)—De F.

Motacilla arundinacea, Gmel. S. N. i, p. 992, nec L.
Sylvia strepera, Vieill. Nouv. Dict. d'Hist. Nat. xi, p. 182.
Calamoherpe arundinacea, G. R. Gray, Handlist, i, p. 208.

1 ♂. Near Bampúr, Balúchistán	1700 ..	April 2.
2, 3, 4 ♂, 5 ♀. Bampúr	2000 ..	April 7.
6 ♂. Shiráz	4750 ..	June.
7 ♂, 8 ♀. Shiráz	4750 ..	August.
9 ♂, 10, 11 ♀. Asupás, between Shiráz and Isfahán	7000 ..	June 26.
12 ♀. Kohrúd, north of Isfahán	8000 ..	July 18.

The specimens from the Persian highlands, Asupás and Kohrúd, agree perfectly with European skins in the proportions of the quills, but those from Shiráz and Balúchistán have the second (or first long) primary shorter in proportion to the third and fourth than in the typical *A. streperus.* In the latter the second quill is nearly or quite equal to the fourth, in the skins from Balúchistán and Shiráz it is decidedly shorter, and in one specimen from Bampúr the second quill is shorter than the fifth. As, however, the difference does not appear constant, and there is variation in the extent to which the wing is rounded, I see no reason for separating the skins from Southern and South-eastern Persia from *A. streperus.*

This reed warbler was found in the same localities as *A. stentoreus,* and appeared to be very common. I found it abundantly at Bampúr, but I never met with it farther east in Balúchistán, and it does not as yet appear to have been observed in India. It may possibly occur in Sind, but Mr. Hume did not obtain it in that country.

Specimens shot at Bampúr in the winter months are generally much more rufous, both above and below, than those killed on the Persian highlands in summer. This difference, I have no doubt, is due to the season of the year, the birds when newly moulted in winter being a much redder brown than in spring. Two specimens from the highlands, however, one shot at Shiráz in June, the other at Kohrúd in July, are equally rufous, perhaps because of their being young birds of the year. This bird doubtless breeds on the Persian highlands, and I thought I took the nest at Asupás, as described under *Bradyptetes Cettii*, but apparently I was mistaken.

I add some notes on the colouration of the soft parts and measurements taken before skinning. Iris brown, bill dusky above, flesh-coloured below, orange within, legs olivaceous horny in winter and in young birds, but I find those in the birds shot at Asupás in June noted as pale brown, with the feet yellowish, soles always pale and yellow, deep yellow in the Asupás birds, claws horny. Measurements, except those of 1 and 2, taken before skinning:—

	1 ♂, Bampúr.	2 ♀, Bampúr.	3 ♂, Asupás.	4, Asupás.	5 ♂, Kohrúd.
Length	—	—	5.4	5.5	5.6
Expanse	—	—	7.25	7.5	7
Wing	2.7	2.55	2.5	2.47	2.45
Tail	2.12	2.05	1.95	2.05	1.95
Tarsus	0.95	0.9	0.9	0.9	0.91
Bill from front	0.53	0.51	0.5	0.47	0.45
Bill from gape	—	—	0.7	0.7	—
Closed wings short of end of tail ..	—	—	1	1.2	1.2

134. A. palustris, (Bechst.)

1 ♂. Shiráz .. .. 4750 .. December.

This specimen is readily distinguished from the last by its much more olivaceous colouration and pale tarsi, agreeing in both with the European species. In colour it is very near *A.* (*? Hypolais*) *dumetorum* (Blyth), but that bird is more olivaceous and has a much more rounded wing, the second primary being shorter than the three next and sometimes than the sixth, whilst in *A. palustris* it equals or exceeds the fourth. In the only specimen obtained the second primary is wanting in one wing, and the third, fourth, fifth and sixth, are partly cut away in the other, but by comparing the length of the second primary with the remaining feathers, it is evident that it agrees in length with that of *A. palustris*. The dimensions of the only specimen obtained are—wing 2.7 inches, tail 2.05, tarsus 0.9, culmen 0.5.

Of *A. palustris* but a single specimen was obtained by Mr. Tristram in Palestine (Ibis, 1867, p. 77), and I find no other record of the occurrence of this bird in Asia. From the fact that only one specimen was obtained in Persia, and that in winter, I think it probable that only stragglers reach the country. Neither Ménétries nor De Filippi noticed it.

On Mr. Blyth's authority (Ibis, 1870, p. 167) I supposed *A. agricolus* Jerdon, of India, to be identical with this species, and quoted it as *A. palustris* in a list of birds from the Wardha valley (J. A. S. B. 1871, xl, pt. 2, p. 273.) I had until lately no means of comparing the two forms. They are quite distinct; *A. agricolus* being very much smaller and much more rufous, its colouration being in general even more ochraceous than that of *A. streperus*, which is a more rufous bird than *A. palustris*. The wing of *A. agricolus* is shorter and more rounded than that of either of the European species, the second primary being rather shorter than the sixth, and the longest primaries projecting only about 0.4 in. beyond the secondaries. The following are dimensions of two specimens of *A. agricolus* measured before skinning:—

	1.	2.
Length	5	5.25
Wing	2.2	2.2
Tail	2.05	2.15
Tarsus	0.8	0.85
Bill at front	0.45	0.47

135. Calamodus melanopogon, (Tem.)

1 ♀. Shiráz	4750 ..	June.
2 ♂, 3 ♀. Shiráz	4750 ..	Summer.
4, 5 young. Asupás, north of Shiráz ..	7000 ..	June 26.

Birds from Persia appear to differ in no respect from those of Europe.

Major St. John found this bird in gardens. I met with it amongst high reeds in a marsh. It evidently breeds on the Persian highlands in the spring, but I only observed it in the southern part of the country, perhaps because I had not opportunities for collecting in suitable localities farther north. It has been met with in Sind and the North-west provinces of India (Ibis, 1870, p. 301, and 'Stray Feathers,' i, p. 199).

Of the birds shot at Asupás I have the following notes. Iris brown; bill blackish above, brown at the base below, orange within; legs horn colour, soles of feet yellowish. Dimensions:—length 5.25 in., expanse 7, wing 2.3, tail 2, tarsus 0.85, bill from the forehead 0.46, from the gape 0.65, closed wings 1.2 short of the end of the tail.

Young birds are very like the adults, but have broad rufous edges to the back feathers, and are generally more rufous, both above and below.

136. * C. schœnobænus, (L.)

Sylvia phragmitis, Bechst., Mén. Cat. Rais. p. 33.

Ménétries shot this warbler at Lankorán on the Caspian, where he met with it in rice fields and amongst reeds. The specimens he says had a rather longer beak and shorter tail than those from Southern France.

137. Potamodus luscinioides, (Savi).

1 ♂. Kohrúd, north of Isfahán .. .. 7000 .. July 18.

The only specimen of this bird which I obtained differs so much from most European specimens that I was for some time much disposed to consider it distinct. It is rather larger, the chin and throat are pure white, not fulvous, as they usually are in European birds, the colour beneath is paler and less rufous, and that of the upper parts darker and browner. The under wing coverts and axillaries moreover are decidedly paler and less rufous. The shape of the wing, too, as was pointed out to me by Professor Newton, to whom I am indebted for the identification of the species, is less convex at the edge, owing to the primaries being straighter. But I find that there is more or less variation amongst European birds in every one of these characters. Gerbe points out that the throat is whiter in the female, and my only specimen belongs to that sex. Under these circumstances I do not think it advisable to propose a new name, but merely to point out that there does appear to be a difference in colouration from the ordinary European bird, and if constant, this may entitle the Persian race to be distinguished.

Another species has lately been described from Eastern Tibet by M. Jules Verreaux, under the name of *L. brevipennis* (Nouv. Archiv. du Mus. vii, p. 67, and viii, p. 65). It resembles the Persian bird in its white throat, but is altogether smaller, with shorter wings and beak.

The legs of the Kohrúd specimen, which was shot and brought in by a collector, were very pale brown, the bill dusky above, whitish below. I did not see the specimen in time to note the colour of the iris. The dimensions measured before skinning were:—length 6 in., expanse 7.5, wing 2.65, tail 2.2, tarsus 0.8, bill from the front 0.5, wings 1.25 short of the end of the tail.

138. **Bradyptetes Cettii**, (Marm.)

Sylvia Cettii, Marmora, Mem. Acad. Torino, 1820, xxv, p. 254.—Mén. Cat. Rais. p. 33.
Sylvia sericea, Natt. Temm. Man. d'Ornith. i, p. 197.
? *Cettia (Potamodus) orientalis*, Trist. Ibis, 1867, p. 79.
? *C. cettioides*, Hume, Stray Feathers, i, p. 194.

1 ♂. Lura valley, Elburz mountains, north of Tehrán	7000	August 7.
2 ♀. Lura valley	6500	August 8.
3. Anán, Mazandarán, north of Tehrán	6500	August 11.

As I have not specimens for comparison I cannot positively say that Sind birds do not differ sufficiently from those of Europe to require specific distinction, but I doubt if their distinctness has been proved; and Mr. Hume only suggests the name of *cettioides* in case 'any one chooses to separate it;' it is, he says, 'though somewhat paler on the upper surface and slightly larger, in other respects absolutely identical with Cetti's warbler.' He gives the following dimensions—wing 2.5 to 2.8, tail *from vent* 2.4 to 3, bill at front 0.4 to 0.5, tarsus 0.8 to nearly 0.9. From the dimensions given below it will be seen that some European specimens nearly equal Mr. Hume's largest birds, and that the species is very variable in size, whilst amongst the different skins which I have examined I find much difference in colour, as is usual in rufous birds.

Mr. Tristram has very kindly lent me his type of *C. orientalis*, and it undoubtedly differs from all European specimens with which I have compared it in the characters pointed out by him. Still the differences are so small that I almost doubt whether they are more than individual peculiarities. Only the examination of a series could decide this.

The following measurements of two of my Persian birds, of a selection of specimens from various localities in Mr. Dresser's collection, and of Mr. Tristram's type of *C. orientalis*, show how much this species varies in size:—

	Wing.	Tail.	Tarsus.	Bill from forehead.	Bill from gape.
♂. Lura valley, Persia ..	2.3	2.25	0.85	0.45	0.57
♀. Lura valley	2.35	2.22	0.85	0.49	0.6
♂. Greece	2.58	2.67	0.93	0.53	0.65
–. Algiers	2.46	2.4	0.77	0.5	0.62
♂. Smyrna	2.2	2.15	0.83	0.46	0.56
♀. Aranjuez, Spain	2.18	2.11	0.8	0.43	0.61
♂. Palestine, type of *C. orientalis*	2.45	2.15	0.9	0.5	0.68

In colouration two of the birds killed by me in the Elburz mountains are of a decidedly darker brown than the third, an old specimen in worn plumage, with the whole tail bright ferruginous instead of nearly hair brown. I believe the difference to be solely due to the fact of the more rufous skin being that of an old bird in faded plumage, whilst the two darker specimens are young birds which have just moulted.

I only shot Cetti's warbler in the Elburz mountains, north of 'Tehrán; it abounded in bushes on the sides of the valleys, and I shot one in thick jungle on the hill side far from water. This bird was found by Ménétries on the Tálish mountains, south of Lankorán, in the hedges around gardens, and it probably occurs in summer at all suitable places on the Persian highlands, for I obtained the nest and eggs in the great marsh at Asupás, north of Shiráz, as I have already mentioned when writing of *Acrocephalus streperus*. The circumstances attending this capture were remarkable, and are worthy of record, as showing how, with every precaution, one may be deceived as to the real proprietor of a nest. Asupás is a village about 7000 feet above the sea, on the edge of one of the broad flat valleys so common in the highlands of Persia. Near the village many springs emerge from the ground, and the whole valley for miles is marshy, and in many places covered with high reeds. Whilst collecting birds in this marsh, my attention was called, by one of the men with me, to a nest placed near the ground in the centre of a tuft of high grass; the nest was cup-shaped, deep, rather roughly constructed of dried grass, and lined with a little down of plants, and it contained two uniformly-coloured dull brick red eggs (almost Indian red), measuring 0.75 in. by 0.57. The eggs were nearly fresh, incubation having just commenced. I had shot several different marsh birds before finding the nest, and I asked the Persian who had pointed it out to me if he knew to which of these it belonged, whereupon he immediately selected an *Acrocephalus*, which I have since identified with *A. streperus*, adding several remarks about the nidification of the other birds I had killed (*Acrocephalus stentoreus*, *Calamodus melanopogon*, etc.), which appeared to me to show that he had really some knowledge on the subject. However, leaving the nest and eggs, I sat down at a short distance to watch for the parent bird, but ineffectually; and after spending at least half an hour in the vain expectation of its return, I carefully noted the spot, and went on farther into the marsh. On my return I approached the nest with due precaution, and, as I came near, a small bird flew out from the tuft of grass, and settled on a reed close by; I fired, the bird fell, and on picking it up I found it to be precisely as the Persian had told me, *Acrocephalus streperus*. I looked upon the identification of the nest as complete, although I was of course rather surprised to find a reed warbler laying dark red eggs. Professor Newton, Mr. Horace Saunders, and Mr. Dresser, however, all of whom have a wide knowledge of the eggs of warblers, assure me that those taken by me unmistakably belong to Cetti's warbler; whilst the bird (a female, as I determined by dissection) which I supposed I had ascertained to be their progenitor, is equally certainly *Acrocephalus streperus*, which, I should add, abounded in the marsh; so I can only suppose that I was mistaken, and that the real owner of the nest skulked off, leaving the unfortunate reed warbler to pay the penalty of her life.

Bradyptetes Cettii has been found by Mr. Hume (l. c.) to be common in Sind in the winter. It has not been detected farther east.

139. * **Accentor collaris**, (Scop.)—De F.

Accentor Alpinus, (Gm.), De F. Viag. in Pers. pp. 276, 348.

Neither Major St. John nor I procured specimens of this bird. It was noticed by De Filippi on the sides of Mount Demavend, north-east of Tehrán, at a considerable elevation. No specimen, however, appears to have been preserved, for there is none in the Turin Museum.

140. **A. rubidus**, Tem. and Schl., var.

1. Kúmeshah, south of Isfahán	.. ..	6000 ..	April.

The only specimen which was procured by Major St. John is intermediate in character between *A. modularis*, the common hedge-sparrow, and the Japanese *A. rubidus*, as was pointed out by Mr. Dresser in the 'Birds of Europe.' It, however, approaches more nearly to *A. rubidus*. Very possibly it may prove a separate species; but as I have only one specimen, and no skin of *A. rubidus* for comparison, I cannot feel certain.

The colouration of the crown and nape is uniform brownish grey, back chestnut brown, the feathers with darker centres, but much less dark and distinct than in *A. modularis*. The ear coverts are rather light brown, and they with the cheek feathers have pale shafts. Wing coverts the same as the back, greater and median coverts with small whitish spots at the end forming a double bar on the wing; quills hair brown, with broad chestnut margins. Tail uniform hair brown. Throat and breast pale slaty grey, rather paler than it usually is in *A. modularis*, whitish near the chin, and passing gradually into the white of the abdomen. Flanks pale slaty with a few chestnut streaks, paler and less numerous than in *A. modularis*. Under tail coverts brown with broad whitish margins: wing 2.7, tail 2.2, tarsus 0.9, culmen 0.63.

As will be seen from the description, this bird differs from *A. rubidus*, as described and figured in the 'Fauna Japonica,' by the presence of chestnut dashes on the flanks. On the other hand, it is decidedly paler in colour than *A. modularis*, and wants the dark centres to the feathers of the crown and nape.

FAMILY CRATEROPODIDÆ.

141. **Crateropus** (*Chatorhea*) **Huttoni**, (Blyth), Pl. XIII, fig. 1.—De F.

Malacocercus Huttoni, Blyth, J. A. S. B. 1847, xvi, p. 476.
Chatarrhœa caudata, Dum., Jerdon, Birds of India, ii, p. 67, partim.
C. Huttoni, Blyth, Ibis, 1867, p. 6.
Crateropus Salvadorii, De Filippi, Viag. in Persia, p. 346.—Salvadori, Atti R. Acad. Sci. Tor. 1868, iii, p. 289.

1 ♀.	Gwádar, Balúchistan coast	—	Jan. 15.
2 ♂.	Báhú Kalát, Balúchistán	—	Feb. 3.
3 ♂.	Dizak, Balúchistán	4000	March 24.

4 ♀. Ispidán, near Aptar, east of Bampúr, Balúchistán	4000	March 31.
5 ♀. Bampúr, Balúchistán	2000	April 5.
6 ♂. Near Bam, south-eastern Persia	3500	April 24.
7 ♂, 8 ♀. Kázrún, west of Shiráz	2800	January.

This bird was first described by Mr. Blyth from specimens collected in Kándahár, by Captain Hutton. It was distinguished from *Malacocercus caudatus*, Dum., by its larger size and the generally paler line of its upper parts. By Dr. Jerdon, in his 'Birds of India,' it was united with *Chatorhea caudata*. But in Mr. Blyth's commentary on Dr. Jerdon's work, in the Ibis, l. c., he called attention to the larger size of the Kándahár bird.

The Marquis Doria collected specimens of a Crateropidine bird beyond Shiráz[1], 'in the region of palm trees,' and to these Prof. De Filippi, in his work on Persia, applied the name of *Crateropus Salvadorii*, after the distinguished Italian ornithologist. I have examined the type of this species, which is in the Museo Civico at Genoa, and there can be no question of its identity with the birds procured by Major St. John near Shiráz, and by myself further to the eastward in Balúchistán, and a specimen of *C. Huttoni* from Kándahár, in the British Museum, is the same in all respects.

C. Huttoni differs from the Indian *C. caudata*, Dum., not only in the larger size and conspicuously larger bill and legs, but also in its colouration. It is a decidedly greyer bird, with narrower and rather paler striation on the head and back. The throat is generally pale greyish brown instead of white, and the rest of the lower parts are greyer and less fulvous. Specimens from Makrán are somewhat intermediate in character, the throat being whiter and the dimensions a little smaller than in the typical *C. Huttoni*, and this is especially the case in the specimen which I obtained at Gwádar.

Another very closely allied form is *Crateropus chalybæus*, Bp. from Palestine, which only differs from *C. Huttoni* in its much larger size (wing 4.3, tail 5.4, tarsus 1.35, culmen 1.1), and in having more markings on the breast. The description of its habits, as given by Mr. Tristram, (Ibis, 1859, p. 30,) might be applied, word for word, to *C. Huttoni*, *C. caudata*, the Burmese *C. gularis*, or any of the Indian *Malacocerci*.

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[1] This is the locality assigned by De Filippi, but the type of the species at Genoa is labelled 'Armadi, Karmán;' and, so far as I know, this appears to have been the only specimen brought back, for there is none at Turin. The Marquis G. Doria has written to me that he obtained the bird on his journey from Karmán to Bandar Abbás.

To facilitate comparison I add a description of the present species. Upper parts generally pale greyish brown, the feathers of the crown, hind neck, and mantle with dark brown central stripes, darkest on the crown, where the feathers are, in fact, dark brown with pale edges, and becoming larger and fainter on the back; rump unstriped. Central tail feathers the same colour as the back. Quills and outer tail feathers very little darker, all with rather darker shafts, and all the tail feathers with rather close subobsolete transverse banding. There is usually more or less of a fulvous tinge on the ear coverts. Lower parts pale isabelline to very pale earthy brown; throat sometimes, but not usually paler, breast and flanks with faint narrow dark longitudinal streaks. Iris chestnut, bill horn colour, dusky towards the point, pale and yellowish near the base below, legs very pale brown.

Measurements (those of Nos. 2, 3, and 4 taken before skinning):—

	Crateropus caudatus.	*Crateropus Huttoni.*				
		1 ♀.	2 ♂.	3 ♂.	4 ♀.	7 ♂.
	Karáchí.	Gwádar.	Báhú Kalát.	Dizak.	Ispidán.	Kázrún.
Length	9	—	9.25	10.5	10	—
Expanse ..	—	—	9.75	11.5	10	—
Wing	3	3.3	3.25	3.5	3.4	3.4
Tail	4.5	4.7	4.25	4.95	5	4.6
Tarsus	1.15	1.23	1.18	1.25	1.15	1.25
Culmen	0.83	0.96	0.93	1.02	0.88	0.94
Bill from gape ..	—	—	1.1	1	—	—
Closed wings, short of end of tail ..	—	—	3	3.9	4	—
Outer tail feathers, short of central	—	—	—	2.5	2.25	—

The Kándahár specimen in the British Museum slightly exceeds all the Persian specimens in length of tail, its dimensions are,—wing 3.5, tail 5.4, tarsus 1.2, culmen 0.9.

C. Huttoni has been found in Southern and South-eastern Persia, Balúchistán, and Afghánistán, but only at elevations below 4000 feet. It was never seen on the Persian highlands, nor has it been observed anywhere in Persia north of Shiráz. It is a most interesting link between the African and Indian *Crateropi* of the subgenus *Chatorhea*[1]. (Conf. Ibis, 1867, p. 6.)

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[1] The type of the genus *Crateropus*, of Swainson, is the black-headed *C. Reinwardti*, Sw. of Western Africa. Species like the African *C. fulvus* and *C. rubiginosus*, with the Asiatic *C. chalybæus*, *C. Huttoni*, *C. caudatus*, *C. Earlii*, and *C. gularis*, together form a well-marked section of the genus about equivalent to *Malacocircus*, which is only a subgenus of *Crateropus*.

The habits of this group have been described so often that it is unnecessary to particularize them. *C. Huttoni*, like *C. caudatus*, lives in small flocks amongst bushes, feeding chiefly on insects. These birds are rather noisy, though much less so than the Abyssinian *C. leucopygius*, Rüpp.; or the Indian *Malacocircus Malcolmi*, Sykes. Their flight is peculiar, and very weak, the usual limit of their efforts being from one bush to another in the neighbourhood; they fly with rapid strokes of their wings for a short distance, and then sail along with wings and tail extended. The flock fly one after the other, not altogether. They are very often to be seen on the ground, and they move by a quick series of hops, keeping much about roots of large bushes, and turning over dead leaves in search of insects.

142. **Drymœca gracilis,** (Licht.[1])—De F.

Sylvia gracilis, Licht. Ver. d. Doubl. p. 34.
Malurus gracilis, Rüpp. Atlas, Aves, p. 3, Pl. II, b.
Drymoica gracilis, Rüpp. Syst. Uebers, No. 117.—Heugl. Ibis, 1869, p. 91, and Ornith. N. O. Afr. p. 242.
Prinia lepida, Blyth, J. A. S. B. xiii, p. 376.
Drymoica lepida, Blyth, J. A. S. B. xvi, p. 460.
Suya lepida, Gould, Birds of Asia, pt. vii.
Burnesia lepida, Jerdon, Birds of India, No. 550, ii, p. 185.
Burnesia gracilis, Blyth, Ibis, 1867, p. 23.—Hume, Stray Feathers, i. p. 195.
Drymœca gracilis, W. Blauf. Obs. Geol. Zool. Abyssinia, p. 373.

1 ♀. Dasht river, west of Gwadár, Balúchistán	—	Jan. 26.
2 ♀. Báhú Kalát, Balúchistán	—	Feb. 3.
3 ♂, 4 ♀. Kalagán, Balúchistán	3500	March 10.
5 ♀. Kalagán, Balúchistán	3500	March 19.
6, 7 ♂. Jálk, Balúchistán	3000	March 17.
8, 9, 10 ♂. Dizak, Balúchistán	4000	March 23.
11 ♂. Bampúr, Balúchistán	2000	April 4.
12 ♀. Shiráz, south Persia	4750	June.

I do not think this bird should be removed from *Drymœca*. Its structure is very similar to that of the type of that genus, *D. maculosa* (Bodd.), and it has the characteristic number of tail feathers (10), long graduated tail, and short rounded wings. The bill is,

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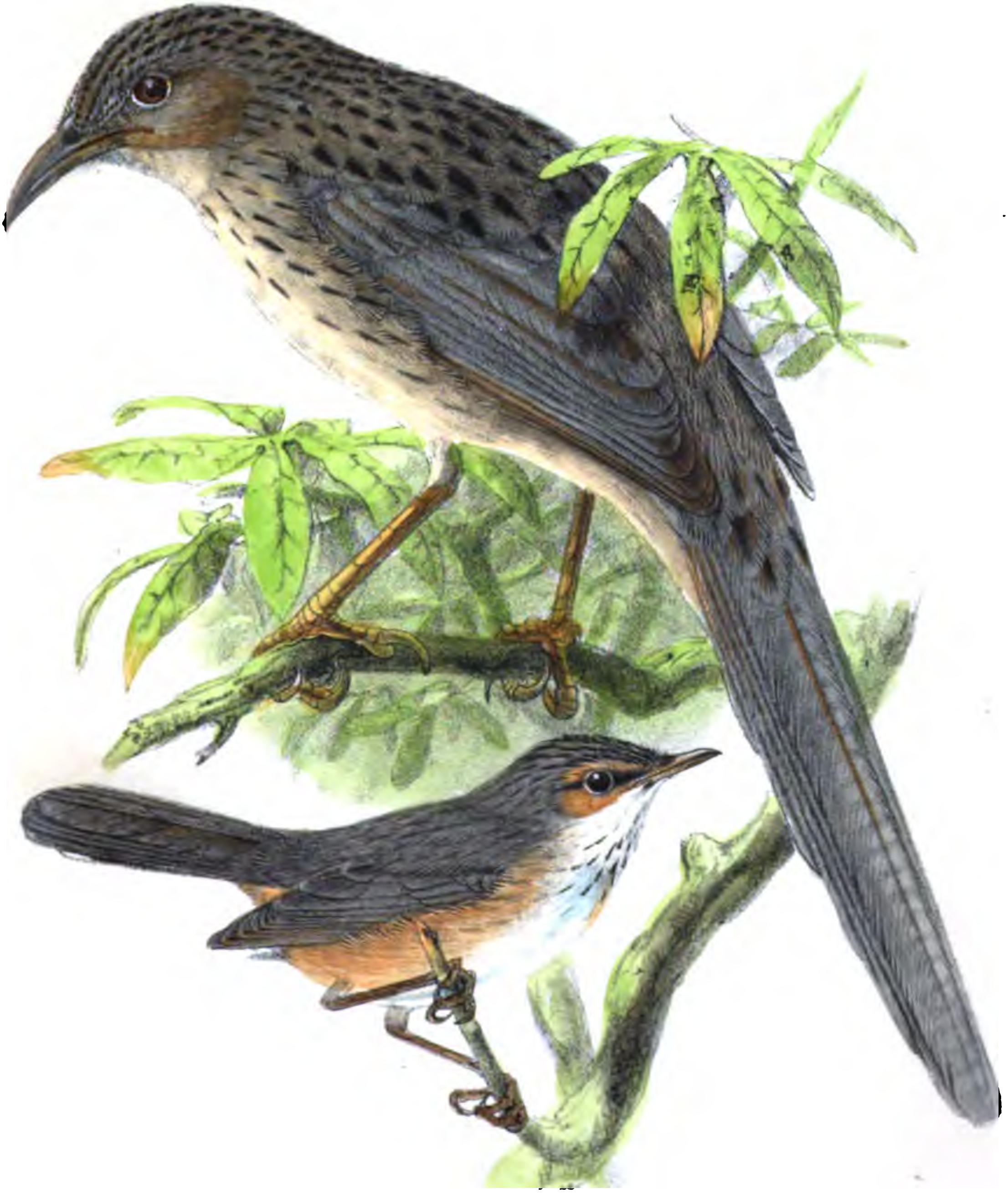
[1] This specific name is by various authors, [illegible], in his Handlist, i, p. 201, incorrectly assigned to Rüppell, [illegible] states that his bird is the *Sylvia gracilis* of Lichtenstein [illegible] refer to the figure in the Description de l'Egypt [illegible] with twelve tail feathers.



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Mintern Bros

1. CRATEROPUS HUTTONI.
2. SCOTOCERCA INQUIETA.

perhaps, a little more slender in proportion, but the shape is the same.

This little bird has an extensive range, from Egypt to Bengal. I have myself seen it on the Abyssinian coast, in Southern Persia and Balúchistán, and in Sind, always in sandy semi-desert localities or salt swamps. Sometimes it is found in thick bushes, but more frequently in the scattered shrubs and small bushes scattered about deserts and sandy shores. It is an active little bird, constantly in motion inside the bushes, hunting for insects amongst the twigs and occasionally on the ground under the bush, and flying the shortest of distances with the feeblest of flights. Its nest, which I saw on the Abyssinian coast, is like that of other *Drymœcæ*, made of grass, oval, and with an entrance at the side near the top. The eggs are described by v. Heuglin as white spotted with brownish. Specimens killed on the 17th of March at Jálk were breeding. From five specimens, measured in the flesh, I take the following dimensions :—

	Dasht river.	Kalagán.	Kalagán.	Jálk.	Jálk.
	♀	♂	♀	♂	♂
Length	5	5	4.9	5	5.1
Expanse	5.4	5.25	5.5	5.2	5.25
Wing	1.65	1.7	1.68	1.7	1.75
Tail	2.45	2.47	2.18	2.45	2.75
Tarsus	0.67	0.67	0.7	0.7	0.69
Bill from front	0.37	0.35	0.39	0.36	0.37
Bill from gape	0.5	—	—	—	—
Closed wings short of end of tail	2.05	1.95	1.8	1.9	2.13
Outer tail feathers short of central pair	—	1.2	0.9	1.2	1.3

Drymœca gracilis is common in Balúchistán and Southern Persia, ascending to the southern portion of the highlands at Shiráz with other Indo-African forms like *Crateropus Huttoni* and *Pycnonotus leucotis*. It was found in the Shiráz gardens by the Marquis Doria. It has not, so far as I know, been observed farther north on the Persian highlands than the neighbourhood of Shiráz.

143. Scotocerca inquieta, (Rüpp.) Pl. XIII, fig. 2.

Sund. Meth. Nat. Av. Tent. p. 7.—W. Blanf, Ibis, 1874, p. 76.
Malurus inquietus, Rüppell, Atlas Reise, N. Afr. Aves, p. 55, i, Pl. 36 b.
Curruca famula, Hemp. et Ehr. Symb. Phys. Aves, fol. bb.
Prinia inquieta, Rüpp. N. Wirbelth. i, p. 113.
Drymoica inquieta, Rüpp. Syst. Uebers, p. 56.—Heugl. Ibis, 1869, p. 129.—Ornith. N. O. Afr. i, p. 244, No. 191.

D. eremita, Tristram, Ibis, 1867, p. 76.
Melizophilus striatus, Brooks, Proc. As. Soc. Bengal, April, 1872, p. 66.—Ibis, 1872, p. 180.—Hume, Stray Feathers, i, p. 200.

1 ♂. Píshín, Balúchistán	600 ..	Feb. 9.
2 ♂, 3 ♀. Ghistigán, Bampusht, Balúchistán ..	3000 ..	Feb. 28.
4, 5, 6 ♂, 7 ?. Magas, between Dizak and Bampúr, Balúchistán	4000 ..	March 28.
8, 9, 10 ♂. Near Niríz, east of Shiráz, South Persia	5000 ..	June 5.
11, 12 ♂. Shiráz, in gardens	4750 ..	Summer.

That Mr. Brooks's *Melizophilus striatus* is the same as *Malurus inquietus*, of Rüppell, I have ascertained by comparing my specimens with one of Mr. Brooks's skins sent to Mr. Dresser, and also with the types of Rüppell's species in the Frankfort Museum. There is a typical example of Rüppell's bird, received from that naturalist, in the British Museum. For the examination of *D. striaticeps* and *D. eremita*, I am indebted to Mr. Tristram, who very kindly sent me his types for comparison. I am by no means surprised that *D. inquieta* should have received new names, for the figure in Rüppell's 'Atlas' is very poor, but I immediately identified the bird with v. Heuglin's description in the 'Ibis.' Probably both Mr. Brooks and Mr. Hume, when assigning their birds to *Melizophilus*, overlooked the circumstance that it has only ten tail feathers; its resemblance to *Melizophilus* in other points of structure is very great, indeed I somewhat doubt whether *Melizophilus* be not really as closely allied to *Drymœca* and *Cisticola* as to *Sylvia*[1], although it is usually classed with the latter.

Mr. Tristram's *Drymœca eremita* precisely agrees with the ordinary form of *S. inquieta*, and it is possible that *D. striaticeps*[2], from Algeria (*Malurus Saharæ*[3], Loche), may be the same, for it only differs in being a little paler in colour, and in the striæ on the breast being nearly obsolete. A specimen without striæ on the breast is described by Mr. Hume from Sind. But I must say that the few specimens I have seen from Algeria agree in the peculiarly pale colouration, and if this character is constant, they may be kept distinct.

D. inquieta is by no means a typical *Drymœca*, the tail being shorter and much less graduated than in the species named by

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[1] The nest of *Melizophilus*, however, is open and cup-shaped, not like that of *Drymœca*.

[2] Tristram, Ibis, 1869, p. 58.

[3] Loche, Rev. Zool. 1859, p. 395, Pl. II, fig. 2.

Swainson as the type of the genus[1]. Indeed v. Heuglin notices that *D. inquieta* is an aberrant form, and Sundevall has proposed to separate it as *Scotocerca* (Methodi Naturalis Avium disponendi Tentamen, p. 7), a name which appears to me worthy of adoption.

It is remarkable that this species, which was previously only known from Northern Arabia, should have been obtained in the Panjáb, Sind, and Balúchistán, by Captain Cock, the discoverer of Mr. Brooks's specimens, Mr. Hume and myself, within a month of each other, in January and February, 1872. Its range, as at present known, is from Northern Arabia to the frontiers of India. I did not see it in any part of Persia north of Shiráz, nor has it, so far as I know, been observed by any other collector.

S. inquieta appeared to me to be very locally distributed in Southern Persia and Balúchistán, though it was far from scarce where it occurred. I usually met with it amongst low scattered bushes and shrubs, on plains and hill sides. Amongst the bushes it was very active, hunting amongst the twigs and frequently flying from bush to bush with the feeble, jerking uncertain flight of other *Drymœcæ*, or hopping about on the ground at the roots of the bushes. It was familiar, trying to hide in the bushes when pursued, and altogether its habits reminded me much of those of *D. gracilis*, Rüpp.

The bill is reddish brown above, deep yellow beneath, except at the tip; legs light brown, iris hair brown. The following are measurements taken on specimens in the flesh; they agree fairly with those given by v. Heuglin, Brooks, and Hume :—

	♂ Píshín.	♂ Ghistigán.	♀ Ghistigán.
Length	4.6	4.7	4.75
Expanse	6	6.25	6.25
Wing	1.83	1.9	2
Tail	1.9	1.87	1.95
Tarsus	0.75	0.8	0.8
Mid toe and claw	0.57	0.57	0.53
Bill from front	0.43	0.4	0.4
Bill from gape	0.52	0.53	0.52
Closed wings short of end of tail	1.25	1.2	1.25
Central rectrices exceeding the outer by ..	0.32	0.25	0.37

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[1] The genus *Drymoica* (*potius Drymœca*) was founded by Swainson in the Zool. Jour. 1827, iii, p. 168, and the types named are *Le Capotier* and *La queue gazée* of Le Vaillant, Ois. d'Afr. t. 130, figs. 1 and 2. The last-named of these, *Stipiturus malachurus*, Shaw, is an Australian bird, and certainly generically distinct from the former, *Drymœca maculosa*, (Bodd.), *macroura*, Lath., *capensis*, Smith, which must be taken as the type of the genus, and which is a bird very nearly allied to such Indian species as *D. inornata*, (Sykes).

The following are the measurements of the typical specimens of *D. eremita*, Tristr. and *D. striaticeps*, Tristr. I am indebted to Mr. Tristram's kindness for the loan of these skins for comparison.

	Wing.	Tail.	Tarsus.	Bill from front.
D. eremita, Dead Sea, ♂	1.8	1.8	0.74	0.4
D. eremita, Wed Areyeh	1.87	1.87	0.75	0.42
D. striaticeps	1.82	2	0.8	0.42
Ditto	1.82	1.9	0.8	0.45

Mr. Hume has described the eggs from specimens obtained by Captain Cock in the Panjáb in April. They are white, rather closely speckled with reddish pink, especially towards the larger end. Specimens of the eggs and nest have been sent by Mr. Brooks to Mr. Dresser. The nest is perfectly drymœcine, oval, domed, made of grass, with an entrance at the side, near the top.

144. Aedon familiaris, (Mén.)—De F.

Sylvia familiaris, Mén. Cat. Rais. p. 32, (1832).
A. galactodes, (Tem.), apud De Filippi, Viag. in Persia, p. 348, nec Tem.

1, 2, ♂, 3, 4 ♀. Bampúr, Balúchistán ..	2000 ..	April 4, 5.
5, 6, 7 ♂. Near Rígán, Narmashir ..	2500 ..	April 18, 19.
8 ♀. Near Bam, South-eastern Persia ..	4000 ..	April 25.
9 ♂. Niríz, east of Shiráz	5000 ..	June 5.
10 ♂. Shiráz	5000 ..	June.
11 ♂. Isfahán	5000 ..	July 10.

I must subscribe to the opinion of those who consider the eastern *Aëdon* separable from *A. galactodes*, Tem. It is perfectly true that intermediate forms occur, but still each race appears fairly constant over a large area, and even Finsch and Hartlaub, Vögel ost Africas, p. 246, describe the two forms as varieties, although they do not consider them specifically distinct. But so far as I can learn, intermediate varieties are an exception, and probably only occur in the tract of country in which the two races meet, this tract of country having, however, rather a peculiar direction, for whilst all specimens from Northern and North-eastern Africa[1], and from Palestine[2] appear to belong to the rufous *A. galactodes*, numerous examples from Syria, Smyrna, and Greece are unmistakably *A. familiaris*. It is thus clear, as is, I think, not unfrequently the case, that these birds do not migrate North and South, but from North-west to South-east, and perhaps in Greece and Syria from East to West and *vice versâ*.

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[1] Except, according to v. Heuglin, the Somali coast, where he met with *A. familiaris*, Orn. N. O. Afr. p. 278.

[2] Tristram, Ibis, 1867, p. 80.

Ménétries, in his original description of *Sylvia familiaris*, l. c., clearly points out its characters, and describes the form to which all Persian specimens obtained by me belong. This is distinguished from *A. galactodes*, first, by the colour of the upper parts to the rump, which are bright rufous in *A. galactodes*, pale earthy brown in *A. familiaris*; (Ménétries says *fusco-cinerea*, but this to me conveys the idea of a rather greyer bird;) secondly, by the middle tail feathers in *A. galactodes* being of the same colour as the rufous rump, whilst in *A. familiaris* they are brown, often darker than the back, and frequently with a very strong tinge of ashy. Sometimes the brown colour covers both webs of the central rectrices, but frequently a part of the outer web is rufous, and such specimens may indicate a partial passage into *A. galactodes*.

Two other differences may be pointed out, but I attach less importance to them, although the first is especially dwelt upon by Ménétries, l. c., and Tristram, Ibis, 1870, p. 496. This is the greater breadth of the black bar before the white tip on the outer rectrices of *A. familiaris*, and the smaller extent of the white tip itself. Ménétries says that there is, on the lateral tail feathers of *A. familiaris*, 'vers l'extrémité, une grande tache noire et transverse (ce qui la distingue surtout de la *S. galactotes*, Temm., chez qui cette tache est ronde et petite).' As a rule, perhaps the black band is broader and the white tip narrower in *A. familiaris*, but the character is very variable in both forms, and in some specimens of *A. galactodes* from Egypt the black band is as broad as in any Persian *A. familiaris*, whilst in some examples of the latter, it is as faint and the white tip as broad as in any average specimen of *A. galactodes*. Another distinction is in *A. galactodes* having rufous edges to the quills, whilst in *A. familiaris* the margins are whitish; but here again there is much variation.

I am quite ready to grant that distinctions founded on the prevalence of more or less rufous tints in birds or mammals, and perhaps throughout the animal kingdom, are amongst the least certain and trustworthy of characters, as they frequently depend on mere accidents of climate or exposure. But still the differences in the case of *A. familiaris* and *A. galactodes* are so constant, that I cannot help thinking it more convenient to distinguish the two races by different names. I greatly doubt if the rufous *A. galactodes* has been found in India as stated by Mr. Hume on M. Verreaux's authority (Ibis, 1871, p. 30); the birds obtained in Rájpútána by Dr. King (Ibis, 1869, p. 355, and 1871, l. c.) were evidently similar to the Persian specimens. Mr. Hume did not procure this species in Sind, but it will doubtless be met with sooner or later in that province.

Throughout the portion of Balúchistán traversed from Gwádar to Jálk and thence to Bampúr, I never noticed *Aëdon familiaris*; but when I arrived at the last named place, at the commencement of April, I suddenly met with this bird so abundantly that I was induced to think that it was migrating. It was equally common in suitable localities in Narmashír on the road between Bampúr and Bam, keeping to bushes and trees in the more fertile portions of the country. I never saw it elsewhere in similar abundance, but it was observed every here and there throughout Southern Persia. To the North of Isfahán I do not recollect seeing this bird, but its occurrence is recorded by De Filippi under the name of *A. galactodes*, and the original types of *A. familiaris* came from the banks of the Kúr near the western shore of the Caspian, where Ménétries procured it in May.

I think it highly probable that the numerous birds seen at Bampúr and in Narmashír were really migrating, and that those found on the Persian highlands in summer leave the country in the winter months, for the allied species *A. galactodes* is well known as a migrant, visiting Southern Europe and Palestine in the summer only. But as *A. familiaris* is only known as a rare straggler in Western India, and never occurs in the South of the Peninsula, the bulk of the summer visitants to Persia must pass the winter around the shores of the Persian Gulf or in Arabia.

FAMILY CINCLIDÆ.

145. **Cinclus aquaticus**, Bechst, var. *Cashmiriensis*, Gould.—De F.

P. Z. S. 1859, p. 494.—Birds of Asia, pt. xii.—Salvin, Ibis, 1867, p. 117. —Dresser, Birds of Europe, pt. xxv.

Cinclus aquaticus, Mén. Cat. Rais. p. 29.—De F. Viag. in Persia, p. 346.

1, 2 ♂. Sultániah, on the Karij river, 30 miles west of Tehrán	5000 ..	November.
3 ♂. Elburz mountains, near Tehrán ..	6000 ..	—
4 ♂, 5 young ♂, 6 young ♀. Karij or Lura valley, north of Tehrán	6500 ..	Aug. 9–14.
6 ♀. Lura valley	7000 ..	August 17.

I was myself inclined to refer all these Persian specimens to *C. melanogaster*; but as Mr. Dresser, with a far larger series of Dippers before him than I had examined, considered them *C. Cashmiriensis*, and as Mr. Salvin had previously come to the same conclusion with respect to a Persian specimen in the British Museum, I yield to such high authority, and can only remark that these races are very dubiously separable indeed, and that I cannot recognise the characters pointed out by Mr. Salvin as typical of the Cashmir form. Certainly in my specimens the dorsal feathers are grey with blackish margins, as in *C. aquaticus*. I see Mr. Dresser states that a specimen from Erzeroum closely resembles *C. melanogaster*, but approaches *C. Cashmiriensis*, and the Elburz form is another link in the chain. The essential character is the paler brown on the head and neck in *C. Cashmiriensis*.

Even amongst these Persian specimens there is considerable variation, and as a rule the birds from higher elevations have a much more uniformly dusky abdomen than those from lower stations. The latter, indeed, have the anterior and central portion of the abdomen reddish brown, whilst the head and hind neck are of a lighter brown than in the first named; none, however, having the distinctly ferruginous abdominal region of *C. aquaticus*. One specimen, No. 6, killed at an elevation of 7000 feet, has the whole of the dark abdominal region uniformly smoky brown, there being no perceptible pale or rufous tinge in the anterior portion, as there usually is in European skins of the *melanogaster* race. Another specimen, a young male, evidently a bird of the year, shot on the 9th of August, only differs in having a few white feathers in the middle of the abdomen. The head and hind neck have nearly attained their uniform smoky brown colouration; but in another young bird, a female, shot the next day, those parts are still slaty, with brown edges to the feathers.

Dippers abound in the Elburz mountains upon all the streams. On the southern side of the range they are not found, so far as I am aware, far outside the base of the range, at about 5000 to 6000 feet, but they descend much lower towards the Caspian, and may probably be found as far down as the streams are sufficiently rapid to afford a suitable habitat. I regret that I have no skins from the low country in Ghilán or Mazandarán for comparison with those from the mountains. Dippers were noticed by De Filippi in the same localities as by myself and by Ménétries on the Tálish mountains. In Southern Persia I did not myself meet with any species of *Cinclus*, but one was seen by Major St. John at Dashtiárjan, near Shiráz. As he was unable to procure a specimen the species remains undetermined, but it may very possibly prove identical with the Elburz form.

The skin from Persia in the British Museum, labelled *C. Cashmiriensis*, appears to me to be identical with the specimens obtained by myself in the Elburz.

146. C. sp. (? *C. leucogaster*, Evers.)

1 young ♂. Pass on road across Elburz
mountains, from Tehrán to Anán,
in Mazandarán .. .. .. 8500 .. August.

On several occasions I saw dippers in the higher parts of the Elburz mountains with apparently the whole or nearly the whole of the under parts white; one which I shot floated down a stream and was lost in some rapids amongst rocks. I only secured a young bird of the year, of which the following is a description:—Whole upper parts slaty grey, feathers of the head and back with brown edges, broader in proportion on the head, and becoming fainter and less marked on the rump; quills dark brown, the secondaries and some of the larger coverts with narrow white tips, whole under parts, including the lower portions of the flanks and the under tail coverts, white, rather less pure posteriorly, and somewhat obscured by irregular dusky fringes to the feathers: wing 3.5, tail 1.9, tarsus 1.1, culmen 0.65.

I have two young birds of *C. Cashmiriensis* shot in the Elburz. In both the greater part of the abdomen is dusky as in the adults, only the central portion being white. The bill, too, in both is considerably longer and thicker than in the bird with white under parts. I am inclined to conclude that the latter belongs to a distinct and probably undescribed race; but it is just possible that it may belong to *C. leucogaster*, in which, to judge by a specimen from Lake Baikal in Mr. Dresser's collection, the anterior portion of the abdomen is very pale brown, the centre of the abdomen darker, the under and lateral portions, with the under tail coverts and flanks, dusky as in *C. aquaticus*. My impression is that in the Elburz bird, when adult, the greater portion, if not the whole, of the abdomen is white; but as I never had an adult specimen in my hand I may be mistaken. It should also be mentioned that *C. leucogaster* is stated by several authors to have the greater part of the under plumage white, but this is not shown in Gould's figure in the 'Birds of Asia,' nor is it the case in any Central Asiatic dipper which I have seen.

FAMILY HIRUNDINIDÆ.

147. **Hirundo rustica**, L.—De F.

1 ♀. Kalagán, Balúchistán	3500	..	March 10.
2 ♂. Jálk, Balúchistán	3000	..	March 16.
3 ♀. North-west of Bampúr, Balúchistán	2000	..	April 12.

Common throughout Persia in the summer, and breeds at heights from about 4000 feet to about 8000. At Kalagán and Jálk the birds appeared to be arriving in March, and on dissection it was evident that they were commencing to breed.

148. **H. rufula**, Temm.

Temm. Man. d'Ornith. ed. ii, pt. iii, p. 298.—Gould, Birds of Asia, pt. xx.
? *H. daurica*, L. nec Gould.

1, 2, 3 ♂. North-west of Bampúr, Balúchistán	2000	..	April 12.
4 ♂. Shiráz	4750	..	(?)

Whilst I follow Bonaparte, Gould, and others in using Temminck's name for the western form of rufous-naped swallow, with faint narrow striæ beneath, I am by no means convinced that the bird is not, as contended by Mr. Swinhoe, P. Z. S. 1871, p. 346, the true *H. daurica* of Linnæus. It is singular, if Linnæus described the eastern form with strong pectoral striæ, that he made no mention whatever of the latter character (Mantissa, p. 528).

I only met with this swallow in Southern Persia and part of Balúchistán. It was more common near Shiráz than elsewhere, and I never met with it farther to the north.

149. Chelidon urbica, (L.)—De F.

1 ♂. Near Karmán, south-eastern Persia	7000	May 7.
2 ♂. Near Shiráz, southern Persia	5500	May.
3, 4 (young). ? Shiráz	—	—

Not rare on the Persian highlands, about towns, and villages, though it is scarcely so common as it is in many parts of Europe. The Persians encourage the house martin to build in houses by hanging up little stands for them to settle upon, their presence in a house being considered lucky. I usually found their nests in villages at a considerable elevation, 6000 or 7000 feet, but the birds breed in Shiráz and other towns below 5000 feet. They are, of course, only summer visitors on the Persian highlands.

150. Cotyle riparia, (L.)—De F.

1. Plain of Persepolis	5000	May.

Bank martins are rare in Southern Persia, and the only specimen obtained is one shot by Major St. John on his road from Tehrán to Bushire. De Filippi, however, found them abundant at Miána in Northern Persia, between Tabriz and Kazvín.

151. Cotyle (*Ptyonoprogne*) rupestris, (Scop.)—De F.

1 ♂. Máyín Kotal, north of Shiráz	5500	June 24.
2 ♂. Dehgirdú, plateau between Shiráz and Isfahán	8000	June 29.
3 young ♂, 4 ♀. Lura valley, Elburz mountains	7000	Aug. 14.

Some of the specimens obtained appear rather smaller than Indian birds. Jerdon gives the wing of the latter at 5.75 inches (Birds of India, i, p. 166), but Hume points out (Stray Feathers, i, p. 2) that this is too much, the measurement of the closed wing in his specimens being from 5 to 5.5 inches. The Persian birds have the closed wing 4.8 to 5.1 inches, and Finsch, Tr. Z. S. vii, p. 219, gives 4.7 to 5.3[1] as the length of the wing in European birds, so that apparently western birds are rather smaller than eastern.

I only met with *C. rupestris* on the Persian highlands, where it was tolerably common, keeping about crags. I found it breeding in a ruined caravanserai at Dehgirdu on June the 29th, but I could not get at the nests to see if they contained eggs. They were attached to the vaulted roofs of the cells in the caravanserai.

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[1] That is, he gives 4″ 5‴ to 4″ 11‴, old French measure, which is equal to the above in English inches.

Ménétries found this bird breeding on the mountains of Tálish in June. De Filippi, who met with *C. rupestris* around Demavend in the Elburz mountains, gives as another locality Bandar Abbás in the Persian Gulf, on the authority of Doria. As no specimens have been preserved in the Museums at Turin or Genoa, it is possible that none were compared, and in that case it is probable that the next species may have been mistaken for this one.

152. C. (*Ptyonoprogne*) obsoleta, Cab.

Cotyle obsoleta, Cab. Mus. Hein. Th. i, p. 50.—Sharpe, P. Z. S. 1870, p. 301.—W. Blanf. Ibis, 1873, p. 214.

Ptyonoprogne pallida, Hume, Stray Feathers, i, p. 1.

1 ♀. Pasní, Makrán coast, Balúchistán ..	—	.. Nov. 29.
2 ♂, 3 ♀. Gwádar, Balúchistán	—	.. December.
4. Near Gwádar	—	.. Jan. 23.
5 ♂. Báhú Kalát, Balúchistán	—	.. Feb. 1.
6 ♂, 7 ♀. Kalagán, Balúchistán	3300	.. March 12, 13.
8 ♂. Jálk, Balúchistán	3000	.. March 17.

I have ascertained the identity of this form with Cabanis' species, by comparison with the types in Berlin, and with specimens from North-eastern Africa in the British Museum. I obtained it in Sind about the same time as Mr. Hume did, and I subsequently found it common throughout Balúchistán. I never saw it on the Persian highlands, where it appeared to be entirely replaced by *C. rupestris*, just as in Western and Central India it is represented by *C. concolor*, Sykes, a still smaller form.

C. obsoleta is far from being so thorough a crag martin as *C. rupestris*. I have often met with it about hills, but I think more frequently still in the neighbourhood of the broad stream beds, usually dry, which intersect the desert plains of Balúchistán, but which, from containing more vegetation than the surrounding country, afford a larger quantity of insect food to swallows and martins. *C. obsoleta* was very common in December and January along the sea shore. I did not see much of it in its breeding haunts, though the birds at Kalagán and Jálk in March were in pairs, hunting about particular spots as if building nests; and the males which I dissected had enlarged testes. They doubtless breed on rocks like their allies.

I have the following notes on the colours of the soft parts, and the measurements taken on birds just after they were shot. Iris dark brown, bill black, inside of mouth dirty yellow, tarsus dark brown, soles whitish. The sexes appear not to differ in size: length 5.3 to 5.5, expanse 12 to 12.5, wing 4.65 to 4.8, tail 1.9 to 2.05, tarsus 0.4. The wings extend from 0.4 to 0.7 inches beyond the tail; the under tail coverts are usually about a quarter of an inch short of the end of the rectrices, and the outer tail feathers exceed the central by from one to two-tenths of an inch.

FAMILY PYCNONOTIDÆ.

153. **Pycnonotus leucotis**, (Gould).—De F.

Ixos leucotis, Gould, P. Z. S. 1836, p. 6.
Otocompsa leucotis, Jerdon, Birds of India, ii, p. 91.—Hume, Stray Feathers, i, p. 181.

1 ♀. Báhú Kalát, Balúchistán	Sea level	Feb. 2.
2 ♂. Ghistigán, Bampusht, Balúchistán	3000	Feb. 27.
3 ♂. Dizak, Balúchistán	4000	March 23.
4 ♂, 5 ♀. Borasjún, near Bushire, southern Persia	Sea level	May.
6 ♂. Khisht, north-east of Bushire	1800	January.
7, 8, 9, 10 ♂, 11 ♀. Oak forest, near Shiráz	7000	June.
12, 13, 14 ♀. Near Shiráz	4500	July.
15, 16 young ♂. Near Shiráz	4500	(?).

This, the only representative in Persia of the great tropical family of *Pycnonotidæ*, abounds in Balúchistán and the southernmost portion of the Persian highlands, but it is not met with on the plateau, to the best of my knowledge, far north of Shiráz. It, however, extends far into Mesopotamia, and I have seen caged specimens at Karáchí, said to have been brought from Bághdád. Birds from Mesopotamia are highly esteemed in Sind, because they sing far more readily and finely in confinement than those captured in Western India: whether this is due to greater natural powers of song in the birds themselves, or to greater skill in taming them amongst the bird catchers of the Tigris and Euphrates valley, I cannot say, but I can vouch for the fact.

To the eastward this 'bulbul' extends throughout Sind, the Panjáb, and Rájpútána, being found, according to Mr. Hume, J. A. S. B. 1870, xxxix, pt. ii, p. 117, as far east in Central India as Sangor (long. 78° E.), but it is chiefly confined to the great desert tract of North-western India, the climate of which much resembles that of Southern Persia.

There is no constant difference, so far as I can see, between specimens from Persia and those from India; the former may run rather larger, but I have no skin from Southern Persia with a wing exceeding 3.7 inches in length, which Mr. Hume gives as the measurement in a Sind bird. Females appear to be a little smaller than males, and the under tail coverts in the former are rather less brightly coloured as a rule. I have one male specimen, with part of the under tail coverts deep orange. Young birds want the black of the head, or have it replaced by dusky brown.

O. leucotis I have usually met with more frequently on bushes than trees, and I have seen it in places, as at Niríz, east of Shiráz, on a hill side, almost bare of vegetation. It is a lively, active bird, with a very sweet pleasing note.

FAMILY ORIOLIDÆ.

154. **Oriolus galbula**, L.—De F.

1 ♂. Shiráz	4750 ..	May.
2, 3, 4 ♀. Shiráz	4750 ..	—
5 ♂, 6 young ♂. Eklíd, between Shiráz and Isfahán	6700 ..	July.
7 ♂. Eklíd	7000 ..	July.
8 ♂, 9 ♀. Eklíd	7500 ..	July.
10, 11 ♂. Kohrúd, north of Isfahán ..	7000 ..	July 21, 22.

The common golden oriole of Europe abounds in Persia in the summer, and breeds throughout the higher parts of the country. The large gardens and orchards which surround many of the higher Persian villages at elevations above 6000 feet afford an admirable habitat for this bird during the breeding season, and its peculiarly liquid note is often heard amongst the plum, apple, and walnut trees. There is a well marked distinction between the note of *O. galbula* and that of the closely allied, but non-migratory, mango-bird of India, *O. kundoo*, Sykes; a distinction which may be instantly recognised by any one accustomed to either, though it is extremely difficult to explain it in words; I may say that the Indian oriole has a deeper, more liquid, and more flute-like note, but this conveys very little notion of the difference.

O. galbula has been found as far east as Sind[1], and probably extends, in the warmer months, far to the north-east into Central Asia. Its migration, however, is to the south-west: none are found in India in winter, and consequently all the birds met with in Persia and Central Asia during the summer months must resort in the cold season to Arabia or Africa. This bird has been observed in Sind only in September, when migrating.

Family NECTARINIIDÆ.

155. **Nectarinia** (*Arachnechthra*) **brevirostris**, W. Blanf. Pl. XIV.

Ibis, 1873, p. 86.
Alí Sīyánúk, Balúchí.

1 ♂, 2 ♀. Báhú Kalát, Balúchistán ..	— ..	Feb. 4.
3, 4 ♂. Near Mand, Balúchistán ..	800 ..	Feb. 11-15.
5 ♂. Jálk, Balúchistán	3000 ..	March 17.
6, 7 ♂. Kalagán, Balúchistán	4000 ..	March 19.
8, 9 ♂, 10 ♀. Dizak, Balúchistán ..	4000 ..	March 23-25.
11 ♂. Ispidán, east of Bampúr, Balúchistán	4000 ..	March 30.
12, 13 ♂, 14 ♀. Bampúr, Balúchistán ..	2000 ..	April 5.
15 ♂. Rígán, Narmashír, south-eastern Persia	2500 ..	April 18.
16 ♂. Bam, South-eastern Persia ..	3500 ..	April 23.

N. affinis N. Asiaticæ *sed minor, rostro breviore, pileo dorsoque maris viridioribus, feminæ notæo magis griseo. Long. tota* 4.5, *alæ* 2.2, *caudæ* 1.4, *tarsi* 0.6, *rostri a fronte* 0.54, *a rictu* 0.67, *poll. Angl. et dec. Femina vix minor: long. tota* 4.25, *alæ* 2.1, *caudæ* 1.25.

Hab. in Balúchistán, circa Jálk, Dizak, Bampúr, etc.

Male in breeding plumage: the upper parts, with the sides of the head and neck, very dark glossy metallic green, passing more or less into purple; in freshly moulted specimens almost as purple as in

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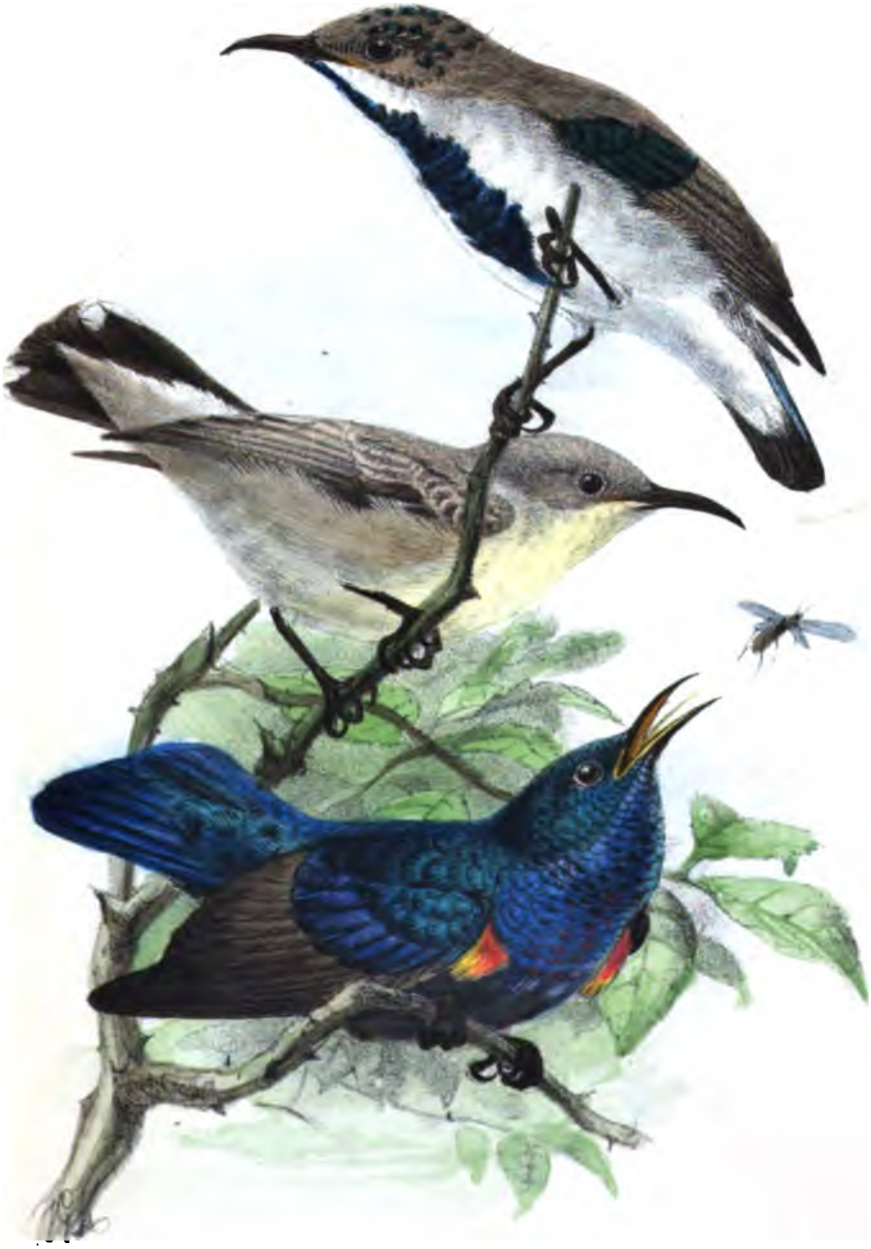
[1] Hume, Stray Feathers, i, p. 182.

Pl XIV
Zoology of Persia



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Mintern Bros Lith.

NECTARINIA (ARACHNECHTHRA) BREVIROSTRIS

N. Asiatica, but usually much greener; lores black, ear coverts with less gloss than the adjoining parts. Wings and their larger coverts hair brown, tail feathers black with a faint purplish gloss, and sometimes, but not generally, with narrow pale tips. Chin, middle of throat, and upper breast rich metallic purple, with a shade of steel blue, the latter separated by a narrow pectoral band, not always well marked, of copper red, from the still darker bluish purple of the lower breast, abdomen, and under tail coverts. On each flank behind the axil is the tuft of yellow and scarlet feathers characteristic of the group to which this species belongs. Iris brown, bill and legs black.

The male in non-breeding plumage resembles the female, except that it has the usual purple stripe from throat to vent, the rest of the underparts being pale grey, whilst the wings and tail are rather darker than in females, and there is a tinge of purple gloss on the smaller wing coverts and rectrices.

Female: above greyish brown, quills and wing coverts hair brown with pale margins, tail blackish brown, all the outer tail feathers tipped with whitish, the amount being largest on the outermost feathers, on which it extends some distance up the outer web. Lower parts greyish white, with more or less pale yellow on the throat and breast, little or none on the chin and abdomen.

The following are the measurements of five specimens taken when fresh. I add those of another female from the dried skin :—

	5 ♂.	6 ♂.	7 ♂.	11 ♂	10 ♀	14 ♀.
Length	4.5	4.3	4.3	4.5	4.25	—
Expanse	—	6.75	6.75	7	6.5	—
Wing	2.23	2.17	2.16	2.25	2.1	2.05
Tail	1.48	1.35	1.35	1.4	1.28	1.15
Tarsus	0.63	0.6	0.6	0.6	0.6	—
Bill from front ..	0.53	0.55	0.52	0.53	0.55	0.55
Bill from gape ..	—	0.67	0.67	0.66	0.72	—
Closed wings from end of tail	0.7	0.7	0.6	0.6	0.5	—

The description has been copied from that in the 'Ibis.' The species is closely allied to *N. Asiatica*, but differs in being rather smaller with a considerably shorter bill, and a green instead of purple gloss on the upper parts, thus showing a slight approach to the Palestine bird *N. osea*, Bp. The female is much greyer above than the same sex of *N. Asiatica*. In the accompanying plate the lower figure represents the male in breeding plumage, the upper figure the same sex in winter, the central figure the female.

I first met with this sun bird at a short distance from the Makrán coast, and I subsequently found it in all the parts of Balúchistán traversed, up to an elevation of 4000 feet, wherever there was a sufficiency of bushes. Its favourite resort appeared to be thickets, chiefly of tamarisk, in some of the stream beds, but it was very common in gardens at Bampúr and Bam, and appeared to have an especial predilection for rose bushes. Its habits differed in no respect from those of the allied species, except that it occurred in small patches of vegetation sparingly scattered in a land of desert and barren rock. When I first came accross specimens, towards the end of January, the males were in winter plumage, but in the course of the next month all rapidly acquired their breeding livery, and those shot in March had completed their moult.

This bird is very probably confined to Balúchistán and the low portions of Fárs in Southern Persia, perhaps ranging along the north-east coast of the Persian Gulf, but it has not been obtained in the neighbourhood of Bushire or Shiráz. It may extend northward across the deserts of Sístán to the Helmund and Afgháníst́án, and it may possibly inhabit Kelát, but in Sind it appears to be replaced by *N. Asiatica*. In December, near Maskat in Arabia, I saw a *Nectarinia*, which I had at the time no means of shooting; it was not in breeding plumage, and I cannot form an idea as to whether it was the present species, *N. osea*, or an undescribed form.

FAMILY TROGLODYTIDÆ.

156. **Troglodytes parvulus**, Koch.—De F.

T. Europæus, Mén. Cat. Rais. No. 75, p. 36.—De F. Viag. in Pers. p. 346.

1 ♀. Shiráz, southern Persia .. .. 4750 .. August.
2 ♂. Shores of Caspian, near Resht .. 800 .. November.

The common European wren was found by both Ménétries and De Filippi in the Caspian provinces, where it appears to be common. The specimen obtained by Major St. John at Shiráz extends the range of this bird considerably.

FAMILY CERTHIIDÆ.

157. **Tichodroma muraria,** (L.)

1 ♀. Mazandarán, Northern Persia .. (?) .. March.

The wall-creeper has hitherto only been recorded from the Caspian provinces. It was seen near Bákú by Ménétries. As it extends into India, it is probable that it may be found occasionally in other parts of Persia as a winter visitant.

Certhia familiaris, L., is found in the Transcaucasian provinces, and probably exists in Northern Persia.

FAMILY SITTIDÆ.

158. **Sitta cæsia,** Wolf.

? *S. Europæa,* L. apud Ménétries, Cat. Rais. No. 112, p. 43, nec Linn.

1. Anán, Mazandarán, Northern Persia 6500 .. August 12.

I obtained a single specimen of the common nuthatch in the forests on the northern slope of the Elburz mountains.

Ménétries noticed a nuthatch, which he calls *S. Europæa,* on the rocks of Bákú and in the forests of Lankorán. That seen in the latter locality may very probably have been the present species, which many ornithologists do not separate from *S. Europæa,* but I cannot help suggesting that the birds shot on the barren rocks of Bákú belonged to one of the rock haunting species *S. Syriaca* or *S. rupicola,* most likely the latter.

159. **S. Syriaca,** Ehr.

S. Neumayeri[1], Michah., Sharpe and Dresser, Birds of Europe, pt. xiv.

S. tephronota, Sharpe, Ann. and Mag. Nat. Hist. 1872, ser. 4, x, p. 450.

1 ♂. Near Parpá, east of Shiráz, southern Persia	6000 ..	May 30.
2. Niríz, east of Shiráz	6000 ..	June 2.
3, 4 ♂, 5, 6 ♀. Shiráz	4750 ..	June.
7 ♂. Shiráz	5000 ..	June.

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[1] I do not consider Michahelles' title a Latin name. He simply calls the bird *Sitta Neumayer.*

The specimens from Persia all belong to the large pale variety for which Mr. Sharpe proposed the name *S. tephronota*. I do not think that this form can be separated from the typical *S. Syriaca*, since both vary somewhat in size, and the pale colour of the eastern bird is probably due to its greater exposure to the sun, a cause which appears to have produced in Persia pale races of several birds. Of the species next to be mentioned, *S. rupicola*, I have both dark and pale specimens, those shot in August in the Elburz mountains being decidedly darker than specimens from Central and Southern Persia. The only other character besides size and general colouration pointed out by Mr. Sharpe, as distinguishing *S. tephronotus*, is the prolongation backward of the black stripe through the eye. But here again there appears to me to be no constant difference. Some of the birds belonging to the large pale form have apparently a longer and broader eye streak, I think, than typical specimens of *S. Syriaca*, but in others the stripe precisely resembles that in European examples, and the character is one of which it is somewhat difficult to judge in skins. I must say, too, that the dimensions given by Mr. Sharpe as those of *S. Neumayeri* (*S. Syriaca*) for comparison with the measurements of his type of *S. tephronotus* from Kokánd are taken from a very small specimen, as will be seen by comparing them with those given by Dresser in the 'Birds of Europe[1].'

The following measurements were taken from a bird shot at Niríz, just after shooting it:—

	In.
Length	7.2
Expanse	11
Wing	3.5
Tail	1.95
Tarsus	1.06
Bill from front	1.05
Bill from gape	1.15
Closed wings short of end of tail	0.9

In four other males the wing measures 3.45 to 3.6 in., tail 1.95 to 2.05, tarsus 1.1 to 1.15, bill from the forehead 0.95 to 1.03. In the two females the wings measure 3.4 and 3.7 in., tails 1.85 and 2.08, tarsi 1.05 and 1.16, culmina 1 and 1.02. The iris is dark umber brown, legs and claws horn coloured, bill blackish above, bluish grey below.

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[1] I may here endorse a remark made some time since by M. Hume as to the insufficiency of the measurements usually given by European ornithologists. If, instead of giving the dimensions of one bird, which may or may not be a fairly average specimen, they would furnish the extreme measurements of a dozen at least, males and females, and from different localities, it would much facilitate comparison.

S. Syriaca keeps entirely to rocky parts of the country, and I have myself only observed it upon the hills of nummulitic limestone which occupy so large an area in the neighbourhood of Shiráz. I am inclined to think I have seen it on the cretaceous limestone a little farther north, but I did not notice it in Balúchistán; at least, I think that I once saw a rock nuthatch, but that it belonged to the small kind *S. rupicola*. The present species is, however, found farther to the eastward in Kándahár and to the north-east in Turkestán (Kokánd). These birds, when I saw them in June, were in small flocks, probably families, consisting of the parent birds and the young of the year, which exactly resemble the old birds in plumage. The species is said to be an early breeder in Asia Minor, where Krüper and Seebohm found its eggs in April, and it probably breeds at least as early in the year near Shiráz. Its presence, wherever it occurs, is soon made known by its loud voice. It is certainly one of the noisiest of birds, its call consisting of a rapid repetition of one note. Usually it keeps to the rocks, but I have seen it on several occasions settle on trees, and even hunt over the stems like the common nuthatch; indeed, I shot one specimen at Niríz whilst thus occupied. Its food also is partly vegetable, for I found plum-stones in the stomach of one bird.

160. S[1]. rupicola, W. Blanf. Pl. XV, fig. 2.—De F.

Ibis, 1873, p. 87.
? *S. Syriaca*, Ehr. apud de Filippi, Viag. in Persia, p. 346, (nec Ehr.)
? *S. Europæa*, L. apud Ménétries, Cat. Rais. No. 112, p. 43, partim, (nec Linn.)

1 ♂. Shiráz, south Persia	5000 ..	December.
2 ♀. Kohrúd, north of Isfahán	7000 ..	July 18.
3 ♂, 4 ♀. Lura valley, Elburz mountains, north of Tehrán	6500 ..	August 9.
5, 6 ♀. Lura valley	6500 ..	August 16.

S. Syriacæ, Ehr., *similis, sed minor, fasciâ nigrâ oculari plerumque angustiore et breviore, et præsertim rostro pedibusque multo gracilioribus*

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[1] The generic name has been misprinted *Sitla* in the plate.

facile distinguenda. Long. tot. 6, *alæ* 3, *caudæ* 1.9, *tarsi* 0.9, *pedis* 1.7, *rostri a fronte* 0.8, *a rictu* 1.

Hab. in montibus Persicis, præsertim in Elburz, saxa scopulosque frequentans.

Upper parts slaty grey, the inner and basal portions of all the rectrices, except the central and outer pairs, blackish; a narrow black stripe from the base of the bill on each side through the lores and above the ear coverts to the side of the nape, varying somewhat in breadth and length, but less developed than in *S. Syriaca*; chin and throat white, the same, but less pure, on the breast; abdomen and lower tail coverts dull pale rufous, this colour becoming gradually darker towards the vent; iris dark brown; bill blackish, except below, near the base, where it is pale grey, almost white; legs horny grey, soles pale and slightly yellowish.

The following are the dimensions of the six specimens obtained: those of all, except No. 1, were taken on the freshly shot birds:—

	1 ♂.	2 ♀.	3 ♂.	4 ♀.	5 ♀.	6 ♀.
Length	—	5.75	6	5.75	6.2	6.1
Expanse	—	9	9.25	9.5	9.3	9.5
Wing	3	2.9	3.15	3	3.05	2.95
Tail	1.7	1.8	1.8	1.65	1.9	1.8
Tarsus	0.9	0.88	0.9	0.85	0.92	0.9
Foot	—	—	1.7	1.75	—	—
Bill from front	0.82	0.79	0.82	0.82	0.85	0.85
Bill from gape	—	—	0.95	0.95	1	1
Closed wings short of end of tail	—	0.7	0.8	0.6	0.7	0.9

This species only differs from *S. Syriaca* in its smaller size and very much more slender bill and legs. The eye streak is narrower and less produced backwards, but this character is variable. It is a rock nuthatch, and, so far as I had means of observing it, its habits appear precisely similar to those of *S. Syriaca*. Like that species it keeps in small flocks which hunt about the rocks and stones of the hill sides, often clinging to perpendicular faces of rock and running up, down, and across them, precisely as the common nuthatch does upon trees. The specimen shot at Shiráz, which was obtained by Major St. John, was, I believe, killed on a tree, and I saw a nuthatch, which I have every reason to believe was this species, on a large cypress tree in a valley four or five marches north of Shiráz; but it is exceptional, as with *S. Syriaca*, to see *S. rupicola* elsewhere than upon rocks.

This small nuthatch abounded on the rocky hill sides of the valleys penetrating the Elburz mountains, north of Tehrán, from about 6000

ens, as mentioned above, were d near Isfahán, and one from ler in colour than Elburz specias the pale large race of the Kándahár, and Turkestán, does I think it highly probable that on rocks near Bákú may have no specimen of any nuthatch some limestone rocks at the foot Dizak and Bampúr, some birds ches, but which were evidently too ink were very probably *S. rupicola.* t the typical *S. Syriaca* should be o forms, one rather larger, found in Turkestán, the other much smaller, thern and Central Persia, especially hly probable that the two extreme mediate one.

PARIDÆ.

southern Persia	5500	..	June 2.
.. .. ..	4700	..	June 8.
young ♀. Shiráz	4750	..	June.
[illegible]	—	..	June.
th-west of Shiráz	5000	..	June 22.

highlands in gardens, and espeit appeared to me very abundant, ge orchards of Kohrúd, north of ly so frequently in the Elburz, and the country traversed by him in n in Karmán or Balúchistán, or

back rather darker than European quills are often bluish grey in the

to 8000 feet above the sea. Two specimens, as mentioned above, were obtained farther south, one from Kohrúd near Isfahán, and one from Shiráz, and these are both much paler in colour than Elburz specimens, differing from them precisely as the pale large race of the Syrian nuthatch from South Persia, Kándahár, and Turkestán, does from the typical form of Asia Minor. I think it highly probable that the *Sitta* which Ménétries obtained on rocks near Bákú may have been the present species. I obtained no specimen of any nuthatch east of Shiráz, but I once saw, upon some limestone rocks at the foot of a high hill near Magas, between Dizak and Bampúr, some birds which I noted at the time as nuthatches, but which were evidently too small for *S. Syriaca*, and which I think were very probably *S. rupicola.*

It is a curious circumstance that the typical *S. Syriaca* should be represented to the eastward by two forms, one rather larger, found in Southern Persia, Afghánistán, and Turkestán, the other much smaller, and occupying several parts of Northern and Central Persia, especially the Elburz mountains. It is highly probable that the two extreme forms are descendants of the intermediate one.

FAMILY PARIDÆ.

161. Parus major, L.—De F.

1 ♂. Niríz, east of Shiráz, southern Persia	5500	June 2.
2 ♂, 3 ♀. Shiráz lake	4700	June 8.
4, 5, 6 ♂, 7, 8 young ♂, 9 young ♀. Shiráz	4750	June.
10 ♂. Oak forest, near Shiráz	—	June.
11 ♂. Bandámír valley, north-west of Shiráz	5000	June 22.

Common throughout the Persian highlands in gardens, and especially in orchards. About Shiráz it appeared to me very abundant, and it was equally so in the large orchards of Kohrúd, north of Isfahán, but I did not see it nearly so frequently in the Elburz, and De Filippi considered it rare in the country traversed by him in Northern Persia. It was not seen in Karmán or Balúchistán, or anywhere east of Shiráz.

Some Persian specimens have the back rather darker than European birds, and the margins of all the quills are often bluish grey in the former, instead of those of the secondaries being greenish; but other skins are precisely like those from Western Europe.

The greater tit must breed in Southern Persia not later than April, for near Shiráz, at the commencement of June, the young birds fully fledged were flying about with their parents.

162. **P. phæonotus**, W. Blanf. Pl. XVI, fig. 1.

Ibis, 1873, p. 88.

1, 2, 3 ♂. Oak forest, near Shiráz .. 7000 .. June.

P. atro *affinis, sed major, capite toto, præter nucham albam maculasque laterales pallide flavas* (*? interdum albas*), *nitente nigro; dorso olivascenti-brunneo, uropygium versus pallescente; alis caudâque umbrinis, pennarum marginibus dorso concoloribus; tectricibus alarum majoribus atque intermediis ad apices albo punctatis; gulâ nigrâ; pectore sordide albo, postice et ad latera fulvescente; abdomine hypochondriisque fulvis. Long. alæ* 2.7, *caudæ* 1.85, *tarsi* 0.77, *rostri a fronte* 0.4.

Hab. in quercetis haud procul ab urbe Persicâ Shiráz.

Whole head and neck glossy black, except the white nuchal spot and the usual lateral patches occupying the cheeks, ear coverts, and sides of the neck, which are yellowish white or pale yellow, perhaps becoming pure white in old birds; back olive brown, becoming rather paler upon the rump; wings and tail hair brown, the feathers with olive margins, and the median and greater wing coverts tipped with small white spots, forming a double wing-bar; chin and throat black; breast white, not very pure, and gradually passing into the fulvous or isabelline tint of the abdomen, which becomes deeper and brownish on the flanks; lower wing coverts white, or nearly so.

Three specimens of this new tit were obtained by Major St. John in the oak forests west of Shiráz, in Southern Persia, and it has not hitherto been found elsewhere. The wings measure 2.6 to 2.7 inches, tail 1.78 to 1.85, tarsus 0.76 to 0.8, culmen 0.4 to 0.42.

In size the present species is intermediate between *P. ater* and the large *P. Bokharensis*, Licht. (Evers. Reise von Orenburg nach Bokhara, p. 131). It may easily be distinguished from all described forms belonging to the group of *P. ater* by its olive-brown back.

163. Parus lugubris?, Natt.

1, 2 ♂. Oak forest, near Shiráz .. 5000–7000 .. June.
? 3 ♀. Anán, Mazandarán, northern Persia .. .. .. 6500 .. August 13.

The two specimens from near Shiráz differ from European skins of *P. lugubris* in their whiter underparts and greyer backs. As there appears to be no structural distinction, I doubt if it be necessary to separate the Persian bird. The specimens having been shot in June are, of course, in worn and somewhat faded plumage, which may partially account for the difference; but there appears to be a tendency in many South Persian birds to assume rather paler and duller tints than those of their western representatives.

The two Shiráz birds are adult, and measure:—

	Wing.	Tail.	Tarsus.	Culmen.
1	3	2.5	0.77	0.45
2	2.97	2.45	0.8	0.46

Should it be found that the much greyer colouration of the back in this bird is constant at all seasons, I am inclined to think that the South Persian race might be fairly distinguished from that of Eastern Europe. Specimens of all tits from the forests of Kúrdistán and Lúristán are much needed to show how far the different races are worthy of separation.

The third specimen which I refer, but with still greater doubt, to *P. lugubris*, is a young female bird of the year which I shot at a considerable elevation in the forest, on the northern slope of the Elburz mountains in Mazandarán. It closely resembles the European tit in colour, except that it has a distinctly rufous tinge on the abdomen; but the bill is smaller, and the tarsi and tail are rather shorter. The dimensions, as compared with those of two specimens of *P. lugubris*, one from Greece, the other from Asia Minor, are:—

	Wing.	Tail.	Tarsus.	Culmen.
Elburz ♀ (young). ..	2.8	2.2	0.7	0.42
Greece ♂ (adult). ..	2.8	2.45	0.8	0.5
Smyrna ♂ (young). ..	2.8	2.4	0.75	0.48

If these differences be constant, the Caspian race should be separated under a different name; but I do not think it wise to propose one on the strength of a single specimen.

Parus ater and *P. palustris* were found by Ménétries in the Caucasus, but have not been met with in Persia.

164. P. (*Cyanistes*) Persicus, W. Blanf. Pl. XVI, fig. 2.

Ibis, 1873, p. 89.
1, 2, 3 ♂, 4 ♀. Oak forest, near Shiráz .. 5000–7000 .. June.

P. cæruleo *affinis, sed coloribus omnibus obscurioribus; dorso griseo-olivaceo; pectore abdomineque pallide isabellino-flavis; apicibus albidis tectricum alarium majorum fasciam transversalem præbentibus, latioribus; rostro minore. Long. alæ* 2.55, *caudæ* 2, *tarsi* 0.65, *rostri a fronte* 0.3.

Hab. in quercetis haud procul a Shiráz.

Crown of the head dull verditer blue; forehead, sides of the head, (except a black line from the base of the bill through the eye to the nape) and a narrow line uniting the supercilia round the back of the head white; nape dull dusky blue, with a small whitish spot behind it, separating it from the olive grey back, which becomes rather lighter coloured and greener on the rump; quills dusky brown, the secondaries and basal portion of the primaries with dull blue edges, terminal portion of the primaries narrowly edged with white; wing coverts dull blue, the greater coverts and the last secondaries broadly tipped with white, the former making a well marked wing-bar, much broader than in *P. cæruleus*; tail dull blue above, bluish grey beneath, the outermost pair of feathers with white margins externally, except near the tip; chin white and black mixed; throat dull black; breast and abdomen yellowish buff, with a line of dusky black feathers down the centre of the lower breast, middle of abdomen whitish.

The measurements of the four specimens which were collected by Major St. John are the following. I add for comparison those of two European specimens of *P. cæruleus*.

	Wing.	Tail.	Tarsus.	Culmen.
1 ♂. *P. Persicus*	2.5	2.02	0.68	0.33
2 ♂. *P. Persicus*	2.65	1.98	0.68	0.29
3 ♂. *P. Persicus*	2.45	1.98	0.62	0.32
4 ♀. *P. Persicus*	2.4	—	0.66	0.31
5 ♂. *P. cæruleus*, Piedmont ..	2.65	2.1		
6 ♂. *P. cæruleus*, Halle, Saxony	2.65	2	0.71	0.35

The bill in the new species is not shorter than in *P. cæruleus*, but it is considerably more slender[1], and as the colouration of the bird is much paler, I think it deserves separation.

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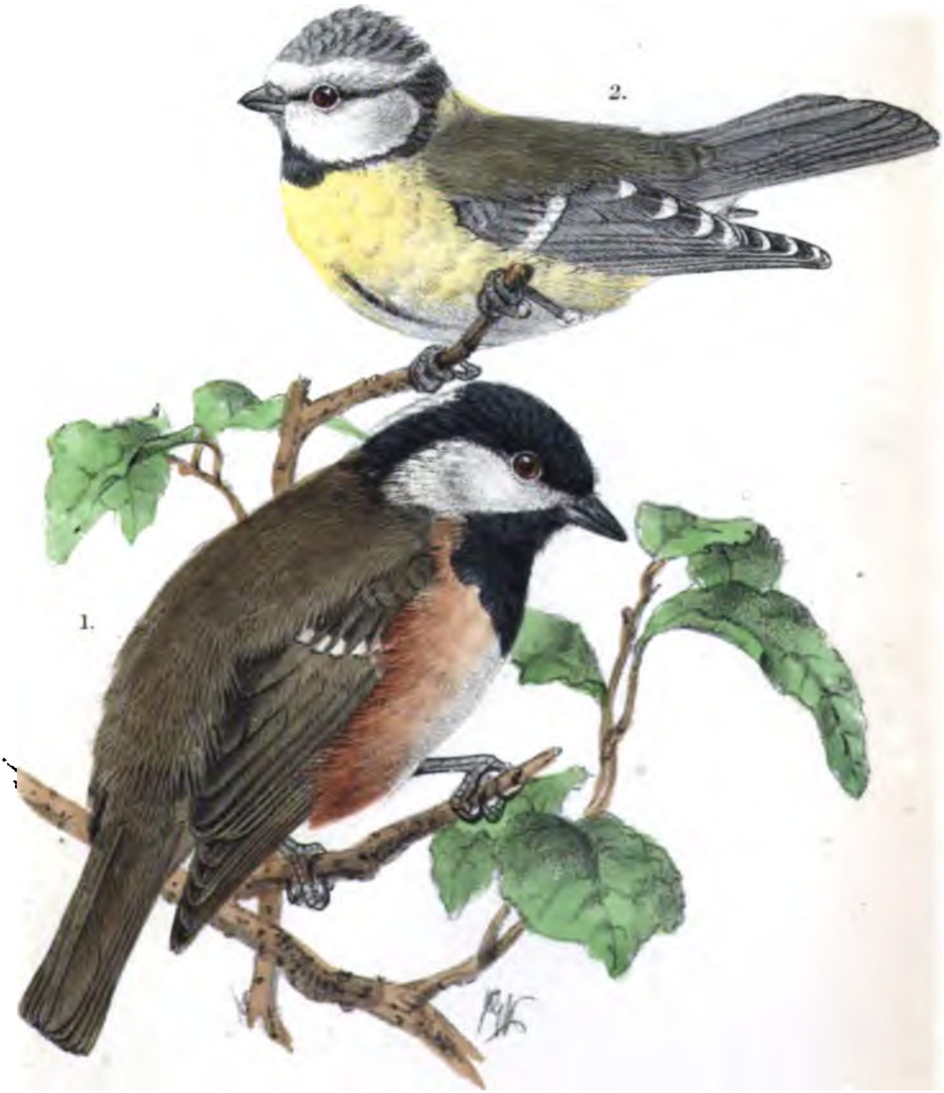
[1] Since writing the above, I have seen Italian specimens of *P. cæruleus* with a bill resembling that of *P. Persicus*.

Pl. XVI
Zoology of Persia



Keulemans del. Mintern Bros. Lith.

1. PARUS PHÆONOTUS
2. P. (CYANISTES) PERSICUS

165. * P. (*Cyanistes*) cæruleus, L.—De F.

The common blue tit of Europe is said by De Filippi to have been found breeding in gardens at Kazvín, north-west of Tehrán, and it is also recorded by Ménétries from Lankorán. There is, of course, a possibility that the bird may, in each instance, have been *P. Persicus*, but I have seen no adult specimens from either locality for comparison. Two skins brought by De Filippi from Kazvín, and now in the Turin Museum, belonged to immature birds, but they precisely resemble *P. cæruleus* at the same age.

166. Acredula tephronota, (Günther).

Orites tephronotus, Günther, Ibis, 1865, p. 95, Pl. IV.

1, 2, 3, 4. Resht, near the Caspian Sea .. — .. Date ?.
? 5, 6, 7 (young). Near Shiráz .. .. 6000 .. June.

The four specimens from the neighbourhood of the Caspian undoubtedly belong to this species, which was previously only known from Turkey and Asia Minor. This extension of the range renders it possible that the birds noticed by Ménétries in the Caucasus under the name of *P. caudatus*, which he says is rather rare in those mountains, may also belong to *A. tephronota*. As, however, the true *A. caudata* is found throughout Southern Russia, an examination of Caucasian specimens will be necessary before deciding.

The three skins from Southern Persia, which were obtained in the oak forest near Shiráz, and which, as well as the Resht specimens, were collected by Major St. John, belong unfortunately to immature birds, so that it is impossible to say whether they should be assigned to *A. tephronota* or to some other species. The sides of the crown are brown, the central portion mixed brown and white, the back is brown with white spots, tail blackish brown, the two outer pairs of rectrices with the outer webs and tip white, the quills brown with pale edges, lower parts dusky white.

The specimens of *A. tephronota* from Resht measure: wing 2.23 to 2.45, tail 2.45 to 2.75, tarsus 0.67 to 0.7, culmen 0.3. The young birds from Shiráz measure: wing 2.1 to 2.35, tail 2.7.

167. * **Ægithalus pendulinus**, (L.)—De F.

Found by De Filippi at Miána in North-western Persia, on the road between Tabriz and Kazvín. No specimens are preserved at Turin.

FAMILY MOTACILLIDÆ.

168. **Motacilla alba**, L.—De F.

M. Dukhunensis, Sykes, P. Z. S. 1832, p. 91.

1 ♂, 2 ♀. Gwádar, Balúchistán	— ..	December.
3 ♂. Mashkíd river, near Isfandak, Balúchistán	3200 ..	March 9.
4 ♂. Kalagán, Balúchistán	3500 ..	March 10.
5 ♂. Jálk, Balúchistán	3000 ..	March 17.
6, 7 ♂, 8, 9 ♀. Dizák, Balúchistán ..	4000 ..	March 24.
10 ♂. Hanaka, south-east of Karmán ..	8000 ..	May 3.
11 ♀. Mashísh, south-west of Karmán ..	6800 ..	May 21.
12, 13 ♂, 14 ♀. Shiráz	4750 ..	June.
15 ♀. Lura valley, Elburz mountains, north Persia	6500 ..	August 8.

Both this and the next species breed on the Persian highlands.

169. **M. personata**, Gould, var. *Persica*.

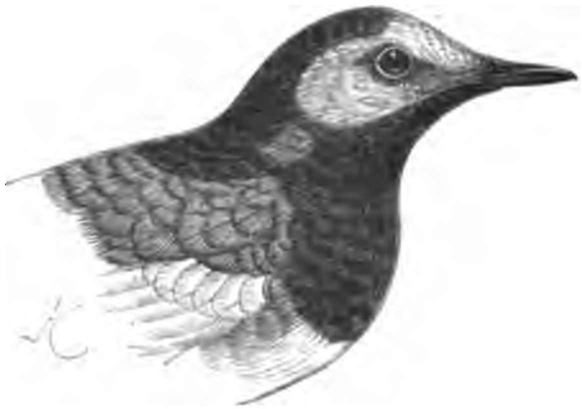
? *M. lugubris*, auct. ex Persia, nec Temm.

1 ♂. Karmán, south-eastern Persia ..	5800 ..	May 8.
♀. Near Karmán	5700 ..	May 17.
3 ♂. Sarján, east of Shiráz	5800 ..	May 28.
4 ♂. Niríz, east of Shiráz	5000 ..	June 4.
5 ♂. Shiráz	4750 ..	June 1.
6 ♂. Shiráz	4750 ..	December.
7 ♂ (young). Isfahán	5000 ..	July 10.

Although these birds agree on the whole with Indian and Turkestán specimens, and with Mr. Gould's figures in the 'Birds of Asia,' there is a slight difference. In Persian skins there appear always to be a few white feathers at the sides of the neck, and more of the region below and behind the eye is white. The black comes down the back of the neck and also down the breast much farther than it does in

M. alba in breeding plumage. In the British Museum, however, there is a specimen of *M. personata* from Persia, obtained probably near Tehrán, precisely like Indian birds.

This wagtail appears to breed on the Persian plateau in larger numbers than *M. alba.* A specimen shot in December still retains the black chin and hind neck. A young specimen is all grey, even the pectoral band is only dusky.



170. **M. sulphurea,** Bechst.—De F.

M. boarula, Penn., De F. Viag. in Persia, p. 348.

1 ♀.	Near Abádeh, between Shiráz and Isfahán	6000 ..	July.
2 ♀.	Kohrúd, north of Isfahán	7000 ..	July 22.
3 ♂.	Resht, Ghílán, near Caspian Sea ..	— ..	November.

Two of these specimens have tails measuring 3.8 and 3.9 in., and consequently belong to the European form with longer, not to the Indian and Malay race (*M. melanope,* Pall.) with shorter rectrices. In the third specimen the tail appears shorter, but it is imperfect.

171. **Budytes flavus,** (L.)

Parus luteus, S. G. Gmel. Reise, iii, p. 104, Pl. XX.
Motacilla flaveola, Pall. Zoogr. Ros. As. i, p. 501.

1 ♂.	Isfahán	5000 ..	April 7.

A single specimen in almost full breeding plumage: crown and nape ashy; lores, feathers beneath the eye and ear coverts black; a rudimentary white superciliary stripe from the base of the bill, continued behind the eye; chin and a line separating the black lores from the golden yellow throat white; back light olive green; lower parts bright yellow. Wing 3.25, tail 2.8, tarsus 0.95, culmen 0.6.

This form resembles *B. cinereicapillus* at least as much as it does typical *flavus.* I have seen similar specimens from India, but not from Europe.

Motacilla flaveola of Pallas has an ashy head, with a white eye streak. *Parus luteus* of S. G. Gmelin included a grey-headed bird with a white eye streak which he considered the female, and a form apparently of *B. Rayi* which he described as the male.

The variability of the yellow wagtails is well known. Finsch and Hartlaub have given a good account of the principal forms in the 'Vögel ost Africas,' pp. 268–274. They unite all the races into one species, distinguishing them, however, as varieties. Professor Newton, on the other hand, in the new edition of Yarrell's 'History of British Birds' distinguishes four races, viz. *B. flavus*, *B. Rayi*, *B. cinereicapillus* (*? B. viridis*, Gm.), and *B. melanocephalus.* I think it is in the present instance most convenient to follow Newton, in order to aid, as far as possible, in working out the distribution of the different forms. Whether they are species or subspecies is a matter of secondary importance.

172. B. Rayi? Bp. var.

1 ♀. Bam, south-eastern Persia .. .. 3500 .. April 22.

This is a specimen which has not assumed the breeding plumage. It differs from all the other skins obtained in its small size and in having a broad buff supercilium. The colour above is brownish olive, below pale yellow with a buff tinge on the breast; chin and throat buffy white. Wing 2.9, tail 2.35, tarsus 0.9, culmen 0.68.

Parus Caspicus, S. G. Gmelin, Reise, iii, p. 104, Pl. XX, fig. 2, described from Ghílán, evidently a *Budytes*, is by Pallas identified with his *Motacilla campestris*, a form allied to *B. Rayi*, with an ashy green head. S. G. Gmelin describes it as ash grey with some yellow mixed.

173. B. melanocephalus, (Licht.)

B. flavus (*melanocephalus*), (Licht.), De F. Viag. in Persia, p. 348.

1 ♀. Khor Askán, Bampusht, Balúchistán	3500 ..	March 6.
2 ♂. Jálk, Balúchistán	3000 ..	March 17.
3 ♂. Kalagán, Balúchistán	3500 ..	March 18.
4 ♂. Dizak, Balúchistán	4000 ..	March 22.
5 ♂, 6 young ♀. Shiráz	4750 ..	June.
7 ♂. Asupás, between Shiráz and Isfahán	7000 ..	June 26.

Even amongst these specimens I can distinguish two fairly separable races. All have the cap black without pale supercilia, but Nos. 1–4 from Balúchistán have a white chin and cheek stripe separating the black of the lores and infraocular region from the yellow throat, and the wings measure 3.1 to 3.25, whilst Nos. 5 and 7 from the Persian highlands have no white on the chin, and wings which would measure, if perfect, nearly 3.5: the quills are much worn in both, and the back browner than in the Balúchistán specimens, which are in full breeding plumage.

174. B. citreolus, (Pall.)

Motacilla citreola, Pall. Reise, iii, p. 696.
M. citrinella, Pall. Zoogr. Ros. As. i, p. 503.

1 ♂. Mashkíd river, near Isfandak, Balúchistán	3200 ..	March 9.
2 ♂. Dizak, Balúchistán	4000 ..	March 24.

The first is a young bird in winter plumage, the second is an adult in change. Both are decidedly small.

	Wing.	Tail.	Tarsus.	Culmen.	Hind claw.
No. 1	3.1	2.75	0.97	0.7	0.45
No. 2	3.05	2.65	0.92	0.62	0.46

These dimensions scarcely exceed those of the eastern race *B. citreoloides*, Hodgs.

175. Anthus trivialis, (L.)

A. arboreus, auct.
Anthus agilis, Sykes, P. Z. S. 1832, p. 91.

1 ♂. Pass north of Tehrán, Elburz mountains, north Persia	9000 ..	August 17.

The tree pipit appears to be a rare bird in Persia. Its absence throughout the country in general is of course explained by the want of trees, but it might have been expected to occur more commonly in gardens, and in the better wooded parts of Southern Persia, than appears to be the case. My only specimen was obtained on the high range of the Elburz mountains, just north of Tehrán, and on a nearly bare hill side, where there were no trees and but few bushes.

176. **A. pratensis**, (L.)—De F.

1 ♂.	Persepolis, near Shiráz	4500 ..	June.

I did not myself meet with the common meadow pipit, but a single specimen was obtained by Major St. John. This Professor Newton has compared, and he finds it only differs from British skins in having a white spot on the third pair of rectrices counting from outside, a character which, however, is occasionally met with in birds from the continent of Europe.

This pipit appears to be rare in Persia, but its occurrence might have been expected, because it was procured at Ferozpúr, in North-western India, by Mr. Hume (Ibis, 1869, p. 355, and 1871, p. 36).

177. **A. cervinus**, (Pallas).

A. Cecilii, Audouin.

1 ♂.	Dizak, Balúchistán	4000 ..	March 24.
2 ♂.	South-east of Karmán..	8000 ..	May 2.

This also appears to be rather a scarce bird in Persia.

178. * **A. Richardi**, Vieil.

A. rupestris, Mén. Cat. Rais. p. 37, nec Nilss.

Obtained by Ménétries on the Tálish mountains, near Lankorán.

179. **A. spinoletta**, (L.)—De F.

A. aquaticus, Bechst., De F. Viag. in Pers. p. 348.

1 ♂.	Mashkíd river, near Isfandak, Balúchistán	3200 ..	March 9.
2 ♂.	Kalagán, northern Balúchistán ..	3500 ..	March 12.
3 ♂.	Near Kalagán	4000 ..	March 19.
4, 5 ♀.	Dizak, northern Balúchistán ..	4000 ..	March 22–24.
6 ♂.	Abádeh, between Shiráz and Isfahán	6000 ..	July.

I found the water pipit far from rare in Balúchistán in spring in all suitable localities. It was less common by far on the Persian highlands in summer. De Filippi obtained it in the Elburz.

If, as Mr. Brooks thinks, the specimens of water pipit found in North-western India belong to a separate race, distinguished by its smaller size, and smaller more defined spotting on the breast, Balúchistán must be the eastern limit of the true *A. spinoletta*. All the specimens obtained agree in measurements and colouration with European birds.

180. A. campestris, (L.)—De F.

1 ♂. Dizak, Balúchistán	4000 ..	March 24.
2. Shirás	4750 ..	December.

Not common. De Filippi obtained it in the Elburz mountains.

181. A. sordidus, Rüpp.

Rüpp. Neu. Wirb. p. 103, Pl. XXXIX, fig 1.—Jerdon, Birds of India, ii, p. 236.—Layard, Ibis, 1871, p. 228.—Tristram, Ibis, 1869, p. 437.
Corydalla griseo-rufescens, Hume, Ibis, 1870, p. 286.
Anthus Jerdoni, Finsch, Trans. Zool. Soc. vii, p. 241.

1, 2 ♀. Shirás	4750 ..	June.
3. Fifty miles north of Isfahán	5000 ..	April.

In my opinion Blyth was right in identifying the large pipit of Northern India with *Anthus sordidus* of Rüppell; and Finsch, Tristram, and Hume are in error in separating it. Mr. Tristram does not state on what grounds he considers the Indian and African forms different, but Messrs. Finsch and Hume give the differences at length; and it is curious that not one single point mentioned by the one is repeated by the other. Dr. Finsch separates the two forms, because the Indian bird, which he names *Anthus Jerdoni*, is 'distinguished by having its primaries narrow, the secondaries and quill coverts broad, margined with ochre fulvous on the outer web; the outermost tail feather is, except the black basal half of the inner web, of the same colour; the second tail feather has a broad fulvous apical spot running on both webs, the under surface is light fulvous, with some obsolete dark blotches on the throat.'

Now, in the Abyssinian specimens in the British Museum, collected by myself, the primaries are narrower than in a skin in the same collection marked from the Himalayas. The breadth of the secondaries and their fulvous margins vary with the season and wear, but there is certainly no constant difference. In both forms the terminal portion of the two outer pairs of tail feathers are pale fulvous at the end; but the extent of the fulvous termination, on the second feather especially, varies both in Indian and African skins, in some cases being confined to the tip, in others extending some distance up the feather, and the fulvous tip is more developed in the skins brought by myself from Abyssinia than in those described from Mr. Jesse's collection by Dr. Finsch. I should add that Dr. Finsch appears to have had but two Abyssinian skins and one from India for comparison.

Mr. Hume compared a series (doubtless a large one) of Indian examples with Rüppell's description and figure of the bird inhabiting Abyssinia (he appears not to have seen any skins of the latter), and founded the distinction essentially on the presence of striæ on the breast of the former, and their absence in the latter. Now that the presence or absence of these striæ is not a specific character is shown by Finsch himself, who describes (l. c.) one Abyssinian specimen as exhibiting, and the other as wanting them. I also pointed out (Geol. and Zool. Abyss. p. 383) that some Abyssinian specimens are spotted on the breast. Mr. Hume also speaks of the grey-brown upper and reddish under surfaces as being the leading characteristics of his *C. griseo-rufescens,* but only, if I understand him rightly, as differentiating it from the South Indian form *C. similis,* Jerdon. As to the characters of the latter I have no means of judging.

As a rule the Indian bird appears to be more fulvous than the Abyssinian, especially on the lower parts, but there is no constant difference. I have examined several birds from India, four in Mr. Dresser's collection, and three in the British Museum, and I have compared them with two skins from Abyssinia and eight from other parts of Africa, and I can only conclude, with Mr. Layard, that all the forms are identical. At the same time I feel some hesitation in uniting them with Le Vaillant's *Alouette à Dos Roux,* Ois. d'Af. Pl. 197, *Alauda pyrrhonota,* Vieill., for the bird represented looks smaller, and I have never seen a specimen of *Anthus sordidus* with ferruginous rump and ear coverts, as represented in Le Vaillant's plate.

There is considerable variation in size amongst the Persian specimens, which I refer to this species. They measure:—

	Wing.	Tail.	Tarsus	Culmen.
1. Shiráz	3.7	3.22	1.05	0.8
2. Shiráz	3.8	3.22	1.1	0.82
3. North of Isfahán ..	4.05	3.6	1.07	0.8

The last being the largest specimen I have ever seen, exceeding even one from Senafé in Abyssinia, of which I gave the measurements in my account of the birds collected in that country (l. c.). The tail is especially long. In this skin there is a small whitish spot on the antepenultimate pair of rectrices; the whole tip and outer margin of the penultimate pair, and all the outer pair except the basal portion of the inner web, being fulvous white; the division between the colours on the two outer pairs of rectrices being very oblique. Generally the colouration of this form only differs from that of *A. campestris* by being much more fulvous, the distribution of colour being the same. The size of *A. sordidus* is usually greater, but specimens of the two species agreeing in dimensions may be found; and when the plumage of *A. sordidus* is much worn, it is at times scarcely distinguishable from *A. campestris* in the same condition.

FAMILY ALAUDIDÆ.

182. Alauda arvensis, L.—De F.

1 ♂, 2, 3. Bushire	— ..	January.
4, 5 ♂, 6. Bushire	— ..	February.
7 ♀. Near Shiráz	6000 ..	July.
8 ♀. Shiráz	4750 ..	August.
9 ♂. Asupás, between Shiráz and Isfahán	7000 ..	June 26.
10 ♂, 11 ♀. Resht, Ghílán	— ..	November.

There is as usual much variation in size, length of bill, etc. Most of the specimens are rather short billed, and some from Bushire and Resht resemble the *agrestis* race of Central Europe. The following measurements of the two largest and two smallest specimens illustrate the amounts of variation :—

	Wing.	Tail.	Tarsus.	Culmen.	Hind claw.
1. Resht, ♀. ..	4.1	2.55	0.92	0.55	0.53
2. Bushire ..	4.3	2.6	0.9	0.6	0.43
3. Bushire, ♂. ..	4.65	2.65	1	0.7	0.65
4. Asupás, ♂ ..	4.6	2.75	0.98	0.8	0.6

The colour varies slightly. A full account of the variations in the skylark is given in Sharpe and Dresser's 'Birds of Europe.'

Locally distributed throughout Persia, and, so far as I observed, confined to high elevations in the summer. It is probably a winter visitant near Bushire. I obtained no specimens in Balúchistán.

183. * A. arborea, L.

Ménétries obtained the woodlark on the Tálish mountains near Lankorán.

184. Galerita cristata, (L.)—De F.

1, 2 ♂. Gwádar, Balúchistán	— ..	December.
3 ♂. Dizak, Balúchistán	4000 ..	March 21.
4 ♂, 5 ♀. Bam, south-eastern Persia ..	3500 ..	April 22.
6 ♀. Mashíah, south-west of Karmán	6800 ..	May 21.
7, 8, 9 ♀. Shiráz	4750 ..	June.
10 (albino). Shiráz	4750 ..	August.
11 ♂. Bushire	— ..	January.
12 ♀, 13 young. Abádeh, between Shiráz and Isfahán	6500 ..	July.

Universally distributed and very common from the sea level up to at least 7000 feet above the sea. There is great variation as usual in size, length of bill, etc. (see Dresser, Birds of Europe, and Hume, Stray Feathers, i, p. 214). The length of the wing in different specimens varies from 3.75 (Abádeh) to 4.5 (Shiráz).

185. Certhilauda desertorum, (Stanley).—De F.

C. Doriæ, Salvadori, Atti R. Acad. Sci. Tor. iii, 1868, p. 292.

1. Gwádar, Balúchistán	December.
2 ♂, 3 ♀. Near Gwádar, Balúchistán	January 23.
4, 5 ♂, 6. Bushire	January.

All these specimens are very grey with much spotting on the breast, like the majority of Asiatic skins.

Not rare in the desert plains near the coast of the Persian Gulf and the Indian Ocean, but seen nowhere else.

186. Otocorys penicillata, (Gould).—De F.

Alauda penicillata, Gould, P. Z. S. 1837, p. 126.
? *Alauda alpestris*, Mén. Cat. Rais. p. 38, nec L.
O. albigula, Brandt, apud Bp. Consp. Gen. Av. p. 246.
O. larvata, De F. Archiv. p. l. Zool. Gen. ii, p. 382; Viag. in Persia, p. 348.

1, 2 ♂, 3, 4 ♀. Hanaka, south-east of Karmán	8000 ..	May 2.
5 ♂, 6, 7 ♀, 8. Near Isfahán	6000 ..	September.
9 ♂, 10 young ♀. North of Tehrán, Elburz mountains	9000–10000 ..	Aug. 17.

For a complete synonymy of this species and an excellent monograph of the genus *Otocorys*, see Finsch, Abhandl. Naturwiss Ver. Bremen, ii, p. 349. Salvadori (Atti R. Acad. Sci. Tor. iii, 1865, p. 285) showed that *O. larvata*, De F., was merely the summer plumage of *O. penicillata*, as was indeed suspected by De Filippi himself; and this view is fully borne out by the series collected by Major St. John and myself, which contains specimens in both summer and winter plumage.

In its full breeding plumage this is a very handsome lark. In the male the crown of the head and hind neck and the rump are rather dull pink, the colour passing gradually into the brown of the back. In the female there is no pink; all the feathers of the upper parts are light brown with darker central streaks, the black marks on the head being only represented by the darker colour of the feathers, and even the ear tufts are only dark brown. The black of the throat too is much less extensive than in the male, and less intense, that of the space beneath the eyes and ear coverts indistinct, and the ear coverts themselves are very pale brown, not white as in the male. In winter the black portions are much concealed and broken up by pale edges to the feathers; there are pale ochraceous margins to the feathers of the upper parts, and the colour of the legs is lighter and browner. The young bird is spotted, as in other larks, and the wing and tail feathers have brown whitish margins with darker bands inside the white: the breast is yellowish white with indistinct dusky spots.

The bill varies in length, the extreme measurements on the culmen are in my specimens 0.65 to 0.83, females having rather shorter bills than males. The following are measurements of a pair from Hanaka:—

	Length.	Expanse.	Wing.	Tail.	Tarsus.	Hind Claw.	Culmen.
Male ..	8	14	4.6	3.25	0.9	0.35	0.7
Female ..	7.25	13.25	4.45	2.95	0.9	0.32	0.65

All dimensions vary as in most larks. The iris is deep reddish brown, bill blackish above, bluish grey below, tarsi and upper surface of toes (in May) black in the male, dusky in the female, claws the same, soles of feet whitish.

I only met with the horned lark at high elevations; during the summer it never appears to descend below the higher plateaux, and I generally met with it on all which exceed 8000 feet above the sea. At this season the birds are scattered about or in pairs. They either breed late or have two broods, for a young one which I shot on August the 17th was in the spotted nestling plumage. Similarly Mr. Tristram found it breeding on the mountains of Palestine close to the snow line.

I think it probable that the *Alauda alpestris* of Ménétries is the present species, because it was obtained on the Tálish mountains, which are a continuation of the Elburz, and the true 'shore lark' does not appear to have been recognised by any one else south of the Caspian. But I may be in error, and if so, *O. alvestris* must be added to the Persian fauna.

187. **Calandrella brachydactyla,** (Leisl.)—De F.

1 ♂. Near Bam, south-eastern Persia	4000	April 26.
2 ♂, 3 ♀. Hanaka, south-east of Karmán	8000	May 2.
4 ♀. Sarján, south-west of Karmán	7000	May 22.
5 ♂. Near Niríz, east of Shiráz	7000	June 1.
6 ♂. Shiráz	4750	November.
7 ♂, 8 ♀. Asupás, plateau, north of Shiráz	7000	June 25.
9 ♂, 10 ♀. Kushkizard, north of Shiráz	8000	June 28.

Mr. Dresser, in his very complete account of this species in the 'Birds of Europe,' has shown that the rufous-headed form, called *C. Hermonensis* by Mr. Tristram (P. Z. S. 1864, p. 434), is only a variety. I had already come to the same conclusion. I found it quite as abundant in Persia as the normal form of the short-toed lark, and I looked upon the first rufous-headed bird which I shot as quite distinct, not only on account of the head being differently coloured, but also because the brown patch at the side of the breast was ill marked and rufous; but there was no difference that I could see in the measurements, and I subsequently shot many intermediate forms.

This is one of the most generally spread birds in Persia. It is found on almost all the plains, and I found it common in the breeding season at from 6000 to 8000 feet above the sea.

188. **C. pispoletta,** (Pall.)—De F.

? *Alauda pispoletta*, De F. Archiv. p. l. Zool. Gen. ii, p. 383.

1 ♀. Mashísh, south-west of Karmán	6000	May 20.
2 young. Sarján, south-west of Karmán	5700	May 29.
3 ♂. Near Niríz, east of Shiráz	5000	May.
4 ♂. Shiráz	—	June.
5 ♂. Near Kushkizard, between Shiráz and Isfahán	—	June 27.

This is easily distinguished from *C. brachydactyla* by its much shorter secondaries. In the short-toed lark the secondaries are nearly as long as the primaries, in *C. pispoletta* they are at least three quarters of an inch shorter. I am indebted to Mr. Dresser for calling my attention to this (see Birds of Europe, pt. xxi). I did not observe the difference in the two forms when in Persia, and consequently did not notice if there was any difference in their distribution. I only obtained specimens of this lark on the plateau, but it has been procured by Mr. Hume in North-western India[1]. De Filippi obtained it only in Armenia.

Persian specimens measure, wing 3.6–4.0 in., tail 2.4–2.6, tarsus 0.85, culmen 0.5–0.62.

I obtained the nest and eggs of this bird on the 20th of May, close to Mashísh, about forty miles south-west of Karmán, and at an elevation of 6000 feet above the sea. The locality was a plain partly cultivated, and the nest was at the foot of a small bush, near a cornfield. I turned the hen bird off the eggs and shot her. The nest consisted of a few strips of bark and grass, without any regular lining, and was laid in a small hole in the ground; the eggs, three in number, are olive grey, closely spotted, especially near the broader end.

Mr. Dresser says that they 'resemble those of *C. brachydactyla*, but are a trifle larger, have the ground colour clearer and paler, and the spots somewhat darker and more clearly defined.' They measure from 0.82 to 0.87 inches by 0.6.

189. **Melanocorypha calandra**, (L.)—De F.

1, 2, 3 ♂. Bushire	—	February.
4 ♀. Shiráz	4750	May.
5 ♂. Shiráz	4750	June.
6 young. Niríz, east of Shiráz	5000	June 4.

The only specimen of those above quoted which was collected by myself was that from Niríz. Close to the shore of Niríz Lake, in a plain overgrown with grass, I found this bird swarming, most of the individuals seen being young birds with the pale edgings characteristic of the nestling plumage. It is evident that *M. calandra* breeds in Persia at this elevation (about 5000 feet) in May.

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[1] I am inclined to agree with Mr. Hume (Ibis, 1870, p. 531) that the species collected by Dr. Stoliczka in Rupshú (J. A. S. B. 1868, pt. ii, p. 64), was not that usually identified with *C. pispoletta*, but it may very possibly have been the same as is thus identified by Herr v. Homeyer (conf. Dresser, Birds of Europe, art. *C. brachydactyla*), which is probably *Alauda longipennis*, Eversman, and certainly *Calandrella leucophæa*, Severtzov.

190. M. sp. (? *calandra*, var.)

1 ♀. Near Isfahán	5000 ..	April.

The specimen from Isfahán differs so much from the other skins of *M. calandra* that I cannot but suspect it to be a distinct race. It is darker and earthy brown instead of rufous, the dark brown marks on the head and back being clearer than in *M. calandra*, and the sides of the breast far more spotted. It is also very small and has a singularly short bill; wing 4.7, tail 2.45, tarsus 1.1, culmen 0.72. In having the outer tail feathers white, and white tips to the secondaries, it agrees with *M. calandra*.

I have seen a specimen from Algiers, and one from Central Asia resembling this in colour, but they have much longer bills.

191. M. bimaculata, (Mén.)

Alauda bimaculata, Ménétries, Cat. Rais. p. 37.
Melanocorypha torquata, Blyth, J. A. S. B. xxi, 1847, p. 476.
M. bimaculata, Sharpe, Ann. N. H. ser. 4, viii, p. 180.

1 ♂. Gwádar, Balúchistán	— ..	Jan. 13.
2 ♂. Khán-i-súrkh pass, south-west of Karmán	8500 ..	May 23.
3 young. Near Asupás, north of Shiráz	7000 ..	June 25.
4 ♂. Near Kushkizard, north of Shiráz	8000 ..	June 28.

The specimen shot at Gwádar in the winter is much greyer than the others. So far as can be judged from the few specimens collected, this bird breeds at a higher elevation than *M. calandra*, for whilst I found the young of the latter, in nestling plumage, abundant in a plain at 5000 feet, I met with *M. bimaculata* in similar nestling plumage, and in equal numbers, at from 7000 to 8000 feet. For the differences between the two species, see Sharpe, l. c. and in the 'Birds of Europe.'

192. Ammomanes deserti, (Licht.)

? *Alauda Lusitana*[1], Gm. Syst. Nat. ii, p. 798.

1, 2 ♀. Rás Masandim, Arabian coast, entrance to Persian Gulf	—	Dec. 9.
3 ♂. Henjám Island, Persian Gulf	—	Dec. 11.
4, 5 ♂, 6, 7, 8 ♀. Gwadár, Balúchistán	—	Dec., Jan.
9 ♂, 10 ♀. Báhú Kalát, Balúchistán	—	Feb. 1.
11 ♀. Ghistigán, Bampusht, Balúchistán	3000	Feb. 28.
12 ♂. Askán, Bampusht, Balúchistán	3500	March 5.
13 ♂. Dizak, Balúchistán	4000	March 21.
14 ♂, 15 ♀. Parpá, 150 miles east of Shiráz, southern Persia	6000	May 30.
16, 17 young ♀. Fifty miles north of Isfahán	6000	July 16.

Extremely abundant in Balúchistán and on the coast of the Persian Gulf, but it becomes scarce and local in the highlands of Persia. Amongst the barren hills of Balúchistán this was almost the only bird which was abundant, and Hume found it equally so in similar localities in Sind (Stray Feathers, i, p. 211). The two specimens obtained at Parpá on the plateau are more rufous at the base of the tail than any others, and one which has the basal portion of the central rectrices and the edges of the rest rufous is apparently young, with pale edges forming faint transverse bars on the scapulars and interscapulary feathers. Some skins have the breast much more distinctly spotted than others.

The two specimens obtained north of Isfahán were shot on the desert plain which slopes upwards from Marchikúr, the second stage on the road to Tehrán, towards Soh, the third stage. I shot several specimens, but as all were immature I only preserved two. They differ from the adult bird in being generally more rufous, in having the basal portion and margins of all the rectrices pale dull ferruginous with only the terminal portion dark brown, the size of the dark spot being smallest on the outer pair. The greater portion of the quills too, including all the basal part, is the same dull pale rufous, and there are pale rufous edgings to the feathers of the upper parts and breast. But I think these birds are the young of *A. deserti*, and not of a distinct species, because in one there is more brown on the quills and tail feathers than on the other, and also because the young bird from Parpá shows more rufous on the basal portion of the tail than adults. The dimensions are: wings 3.45 and 3.7, tails 2.1 and 2.3, tarsi 0.87 and 0.93, culmina 0.5 and 0.55, or rather less than the full grown *A. deserti.*

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[1] I fail to see any reason for employing Gmelin's name for this form. It is objectionable because the species does not occur in Portugal, and it was merely given to the 'Portugal lark' of Latham, who again described from a drawing, so there is no sufficient evidence of its having been applied to this species.

193. Pyrrhulauda melanauchen, (Cab.)

Coraphites melanauchen, Cab. Mus. Hein. i, p. 124.—Finsch, Trans. Z. S. vii, p. 275, Pl. XXVI.

Pyrrhulauda affinis, Blyth, Ibis, 1867, p. 185.—Hume, Stray Feathers, i, p. 212.

1. Báhú Kalát, Balúchistán .. .. .. February 2.

I obtained a male of this bird near Karáchí, which I immediately recognised as Mr. Blyth's *P. affinis,* and which I sent, with two or three other specimens of interest, to Mr. Hume for notice in his list of the Sind Avifauna. I procured a second at Báhú Kalát, just within the Persian territory, and close to the coast. I have compared the latter with specimens of *P. melanauchen,* obtained by myself on the Abyssinian coastland and compared with a typical specimen in Berlin, and also with the type of *P. affinis,* Blyth, in Mr. Gould's cabinet, and I announced the identity of the two forms in the Ibis for 1873, p. 223. I find this had already been suggested by Finsch and Hartlaub, Vög. ost Af. p. 469.

Mr. Gould informs me that he merely received the typical specimen of *P. affinis* with the locality 'Madras,' and that he has no means of determining the correctness of the label. I think it highly improbable that this species really extends into the southern portion of the Indian peninsula, since even in the greater part of Sind it appears to be entirely replaced by the nearly allied *P. grisea.* For some years, whilst occupied in the southern portion of the Central Provinces in India, I have carefully looked for *P. affinis,* and many a *P. grisea* has been sacrificed in the search, but without success.

P. melanauchen appears to be rare in Balúchistán, and I have only seen it close to the coast.

The male shot near Karáchi measured: length 5.5 inches, expanse 10.25, wing 3.2, tail 2.1, tarsus 0.7, bill from gape 0.45. Iris brown, bill whitish, legs pale flesh colour.

FAMILY FRINGILLIDÆ.

194. Fringilla cœlebs, L.—De F.

1, 2 ♀. Oak forest, near Shiráz	—	June.
3 ♂. Near Shiráz	5000	September.
4 ♂, 5 ♀. Shiráz	4750	September.
6 ♀. Lura valley, north of Tehrán, Elburz mountains	7000	August 10.
7 ♂. Anán, Mazandarán	6500	August 11.

Precisely similar to European specimens. The chaffinch is found in the oak forest near Shiráz, and probably inhabits the forest country west of the Zagros range. In Ghílán and Mazandarán it is exceedingly abundant. I never saw it elsewhere in Persia, and it appears to be confined to the forest regions.

By a *lapsus pennæ*, in the 'Birds of Europe,' owing, I think, to his having misunderstood me, Mr. Dresser makes the chaffinch extend to Balúchistán, but it has not been found south-east of Shiráz, so far as I know.

195. * F. montifringilla, L.

Pallas (Zool. Ros. As. ii, p. 18) speaks of specimens sent from Persia, pale in colour and rather larger than those from Northern Russia.

196. F. spinus, L.

1 ♀. Anán, Mazandarán	6500	August 13.

The siskin has not been observed in Persia elsewhere than in the forest region south of the Caspian.

197. * F. chloris, L.

Coccothraustes chloris, Mén. Cat. Rais. p. 52.

The greenfinch was not obtained by Major St. John nor myself, and De Filippi only observed it on the Caucasus, but Ménétries found it on the Tálish mountains.

Mr. Gray, in his 'Handlist,' gives Persia as a locality for *F. chloro-*

tica, Licht. There is no specimen in the British Museum from Persian territory, and Lichtenstein's types were from Bairút (Beyrout) and Syria. I think the Persian locality possibly rests upon some mistake. The form is doubtfully distinct.

198. **Montifringilla alpicola**, (Pall.)—De F.

Pall. Zool. Ros. As. ii, p. 20.
M. nivalis, De F. Viag. in Persia, pp. 254, 349, nec Linn.
1, 2 ♂. Elburz mountains, Mazandarán .. .. February.

This appears to me a good species, distinct from *M. nivalis*. Pallas, who received it from the Caucasus and 'the Ceraunian[1] mountains surrounding the Caspian,' states that it is distinguished by its long bill. This is precisely the case in the birds obtained by Major St. John, of which the following is a description of the males in winter plumage:—

Upper parts dull brown, the head a little darker than the back, rump, upper tail coverts, which are very long, and central tail feathers brownish black, remainder of the tail feathers white, those near the centrals with blackish tips, which gradually disappear on the outer rectrices; primaries and a few of the smaller coverts near the edge of the wing brownish black, secondaries, except the three or four nearest the body, all the secondary coverts, and the greater primary coverts white, the latter sometimes with dark brown tips; the last secondaries (tertiaries) and scapularies the same colour as the back; chin and middle of throat black, the feathers with white margins, remainder of the lower parts white; bill and legs black: wings 4.55 and 4.8, tails 2.75 and 2.9, tarsi 0.85 and 0.9, culmina 0.75.

Not only is the bill longer and larger than in *M. nivalis*, but it is black, whereas in the European snowfinch it is yellow in winter. In the Elburz specimens the black colour may have been assumed with the commencement of spring; but this is improbable, because the black of the throat is much concealed by white fringes, which would doubtless wear off in the nuptial plumage. Another important difference is that the bird of the Alps has the head cinereous in the male, even in winter plumage; in young males even it is very much more ashy than in the Elburz specimens.

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[1] '*Frequens in alpibus summis Caucasi atque montium Cerauniorum Caspicum lacum ambientium*,' Pall. l. c. I am not quite sure what mountains are meant.

This snowfinch is a permanent inhabitant of the Elburz. The specimens obtained were shot in the snow by a collector whom Major St. John sent into the mountains in February. In summer it keeps to a considerable elevation. De Filippi found it at the base of Demavend, and I saw one flock near the crest of the Elburz, on the road from the Lura valley to Anán, at an elevation of between 9000 and 10000 feet above the sea. The birds were on very steep rocky ground, and I shot one, which rolled down some precipitous rocks, and despite a long search, and much climbing on difficult ground, I was unable to find it.

199. Carduelis elegans, Steph.—De F.

1, 2 ♂, 3 young ♀. Shiráz	4750	June.
5, 6 young ♂. Shiráz	4750	June 12.
7, 8, 9, 10. Shiráz	4750	Summer.

Locally distributed on the Persian plateau, where it is apparently a permanent resident. I first met with it about 90 miles south-west of Karmán, and it was seen here and there on the road to Shiráz, around which town it is common in gardens. In Northern Persia I did not meet with it, but De Filippi records it from Tabriz and Ménétries from Lankorán.

[When in camp at Nanizak, at the foot of the hills, near Bushire, in February, I saw immense flocks of goldfinches flying about the palm groves before roosting. They breed in considerable numbers about Shiráz, and are pretty common everywhere.—O. St. J.]

200. Linaria cannabina, (L.)—De F.

1 ♂. Hanaka, south-east of Karmán	8000	May 2.
2, 3 ♂, 4 ♀ (all young). Near Shiráz	—	July.
5 young ♀. Shiráz	4750	November.
6 young ♀. Shiráz	4750	December.
7 ♂. Elburz mountains, north of Tehrán	—	March.
8 ♂. Lura valley, Elburz mountains, north of Tehrán	7000	August 8.
9 ♀, 10, 11, 12, 13 young. Elburz mountains, north of Tehrán	8000	August 11.

All adult males have bright scarlet breasts, like the birds found in parts of Southern Europe, and some specimens have rather a long bill.

Very common at high elevations on the Elburz, and less so on the higher hills in Southern Persia, apparently descending to lower elevations in winter. On the Elburz mountains in August I found the young birds by themselves in large flocks.

201. L. brevirostris, Gould.

Moore, P. Z. S. 1855, p. 216.—Stoliczka, J. A. S. B. 1868, xxxvii, pt. 2, p. 62.—Hume, in Henderson's Lahore to Yarkand, p. 260, Pl. XXVI.

1 ♂, 2 ♀. Mountains near Abádeh .. .. 8000 .. July.

This is apparently rare, and the only pair obtained was secured by Major St. John on the high plateau between Shiráz and Isfahán. The birds agree well with the figure given by Hume and with his descriptions. The dimensions of the Persian birds agree too with Hume's, and not with those given by Moore.

	Wing.	Tail.	Tarsus.	Bill from forehead.
Male	2.95	2.37	0.64	0.35
Female	2.85	2.2	0.63	0.35

202. Metoponia pusilla, (Pall.)—De F.

Serinus pusillus, De F. Viag. in Persia, p. 349.

1. Hanaka, south-west of Karmán .. 8000 .. May 2.
2, 3 ♂. Lura valley, Elburz mountains .. 6500 .. August 9.
4 ♀. Lura valley, Elburz mountains .. 7000 .. August 14.

This finch also was only met with at a considerable elevation. It was by no means rare in the Elburz mountains, north of Tehrán, but it was also found in the south.

203. Carpodacus erythrinus, (Pall.)—De F.

1 ♂. Lura valley, Elburz mountains .. 6500 .. August 8.
2 ♂. Near Anán, Mazandarán .. .. 8500 .. August 13.

The common rosefinch or scarlet grosbeak was only noticed in the Elburz, but it will probably be found in other parts of Persia. Both the specimens obtained are in breeding plumage.

204. Bucanetes githagineus, (Licht.)

Carpodacus crassirostris, Blyth, J. A. S. B. xvi, 1847, p. 476.

1, 2 ♀. Kalagán, Balúchistán .. .. 4000 .. March 20.
3 ♂. Near Rigán, Narmashír .. .. 3000 .. April 17.

4 ♂. Near Bam, south-eastern Persia	5500	April 27.
5 ♂, 6 ♀. Sarján, south-west of Karmán	5700	May 29.
7 ♂, 8 ♀. Shiráz	4750	June.
9 ♂, 10, 11 young. Kohrúd, north of Isfahán	8000	July 17.

The desert bullfinch was met with here and there throughout Persia. Hume obtained it in Sind in the winter, (Stray Feathers, i, p. 210), but I did not observe it in Balúchistán near the coast, and I only once shot specimens in the higher plains of Persian Balúchistán. It breeds early, the pair shot on May the 29th being young birds apparently; they only differ from the adult female in being of a more rufous brown, and in having broader pale margins to the wings and tail feathers. Bill in the male rich orange or scarlet in breeding plumage only.

I have examined the specimen of *Carpodacus crassirostris*, (Blyth) from Afghánistán, in the British Museum. It is, I believe, one of the types collected by Hutton, and is, in my opinion, identical with *B. githagineus*. Blyth's description applies perfectly to this species.

205. Bucanetes, sp.

1 ♀. Karij valley, Elburz mountains	6500	August 8.

A single bird obtained in the Elburz puzzles me greatly. In many respects it resembles a male *Bucanetes githagineus* in imperfect plumage, but the colouration of the wing coverts, and especially of the tail, is peculiar, and it is probably a distinct species. The following is a description: the plumage is worn, as usual, in birds shot at the end of summer.

Upper parts brown, the feathers of the back rather paler at the edges, on the lower back and rump there are traces of whitish transverse bands; upper tail coverts pale crimson, tail feathers dark brown with whitish edges; the outermost on each side with the outer web and the terminal portion of the inner web white, a dark line running down the shaft to the end; quills brown, the secondaries with whitish margins and tips, (there may perhaps in fresh plumage be pale edges to the primaries also), greater coverts darker brown, secondary coverts white towards the base on the outer web, and with a very narrow margin of bright crimson. Lower parts pale brown, becoming white on the abdomen and lower tail coverts, and washed with pale crimson on the breast and sides of the abdomen: bill brown (? horny), pale near base beneath, legs light brown; wing 3.37, tail 2.07, tarsus 0.67, bill at front 0.37.

I should describe this as a new spieces but for the possibility of its being an abnormal specimen of *B. githagineus*, which it exactly resembles in dimensions and structure. If so, it is probably an old female putting on in part the male plumage.

206. **Erythrospiza sanguinea**, (Gould.)

Fringilla sanguinea, Gould, P. Z. S. 1837, p. 127.
Erythrospiza phœnicoptera, Bp. Mon. Lox. p. 27, Pl. XXX, XXXI.

1, 2 ♂, 3 ♀. Lura valley, Elburz mountains, north of Tehrán	7500 ..	August 11.

The specimens obtained agree with Bonaparte's figures of both sexes. The bill in the male is deep yellow, dusky at the tip and on the upper mandible near the base, legs purplish brown. In the female the bill and legs are brown. There appears to be no difference in the size of the sexes. Length (measured in the flesh) 6.75 to 7.25, expanse 13, wing 4 to 4.3, tail 2.23 to 2.55, tarsus 0.8 to 0.82, bill from forehead 0.45 to 0.5, from gape 0.55.

I only once met with this fine rosefinch. A flock was sitting on some steep rocks by the side of the road in a high valley of the Elburz, and I had the good fortune to bag three.

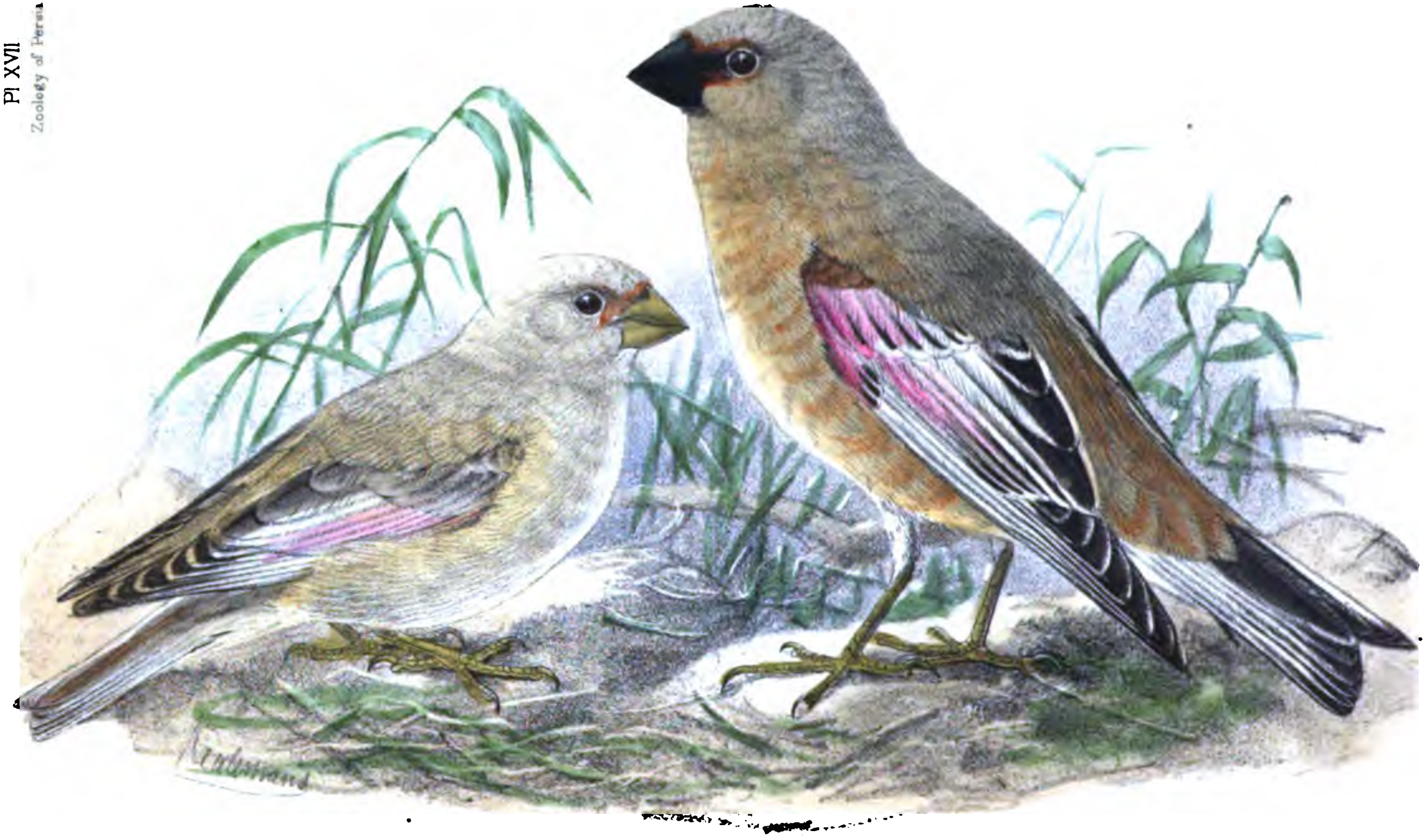
207. **E. obsoleta**, (Licht.), Pl. XVII.—De F.

Bp. Mon. Lox. p. 28, Pl. XXXII (mediocris).—De F. Arch. Zool. Gen. ii, p. 384.
Fringilla obsoleta, Licht. in Eversman's Reise nach Buchara, App. p. 132.

1 ♂. Niriz, east of Shiráz	5300 ..	June 28.
2 ♀. Shiráz	5000 ..	June.
3 ♂. Shiráz	5000 ..	August.
4 ♂. Shiráz	5000 ..	December.
5, 6 ♂. Abádeh, north of Shiráz	6000 ..	July.

De Filippi is in error in stating that the plumage of both sexes is the same. From the figure in Bonaparte's *Loxiens*, and the description given by Lichtenstein and Bonaparte it is clear they had a female or young male before them. Lichtenstein, it is true, says the bill is black, which is a character of the adult male, but he also describes

Pl XVII
Zoology of Persia



Keulemans del

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ERYTHROSPIZA OBSOLETA.

the feet as black, which they never are. It is difficult to recognise the bird from either description or figure, but I have compared my specimens with the type in the Berlin Museum and ascertained their identity. The species is well worth refiguring, being one of the most exquisitely and delicately coloured of the group to which it belongs, and I think the accompanying illustration of it by Mr. Keulemans does it justice. The following is a description of the plumage:—

Male in breeding dress:—lores and a few feathers at the base of the mandible black; upper parts pale sandy brown, upper tail coverts, which are rather long, a little darker and more rufous; tail feathers blackish brown with their outer margins white; this margin occupies the whole outer web of most of the rectrices, but is narrower on the outer pair, on which it does not extend to the tip; quills blackish brown, outer webs of the primaries, and basal portion of the inner webs of both secondaries and primaries white, edges of the secondaries (the last three excepted) nearly but not quite to the tips, and of all the larger coverts a most delicate rose pink, the three last secondaries with broad brownish white margins. Lower parts to the breast the same colour as the back but rather paler, passing into white on the abdomen and lower tail coverts. Bill black, legs brown, claws dusky. Length (measured before skinning) 6.2, expanse 9.75, wing 3.45, tail 2.4, tarsus 0.63, bill from forehead 0.44, wings from end of tail 1.1.

In the male in winter plumage the colour of the upper parts is a little paler, and the bill is horny. The female has the bill horny, and the lores are brown, scarcely differing in colour from the rest of the cheeks; the male in winter may apparently be distinguished by having the lores dark brown or black. There appears to be no difference in the size of the sexes.

Of this rare bird I obtained but one specimen, which was shot in a plain covered thinly with grass and bushes on the shores of the salt lake, near Niríz. The remainder were procured by Major St. John. De Filippi found it breeding in gardens at Kazvín (Viag. in Pers. p. 212), and he says it is also found at Tehrán.

I cannot find any description of *Erythrospiza obscura* (Lichtenstein), from Tehrán, Gray's 'Handlist,' No. 7527, ii, p. 102. No such bird is mentioned in the 'Verzeichniss der Doubletten,' the 'Nomenclator Avium,' or the 'Museum Heineanum.' The name must, I think, be one of the numerous manuscript titles given by Lichtenstein, unless indeed it be a misprint or mistake on a label for *E. obsoleta*.

208. * Coccothraustes vulgaris, Pall.—De F.

Observed by De Filippi in Ghilán at Rústamabád, between Kazvín and Resht.

209. * C. (*Hesperiphona*) carneipes, (Hodgs.)

Coccothraustes speculigera, Brandt, Bull. Acad. Sci. St. Pet. ix. p. 11, (1842).

The species described by Brandt from Northern Persia has been identified by various authors with the Himalayan *H. carneipes*, Hodgson, and Gould, in the 'Birds of Asia,' states that he has compared specimens from the Altai, identified with *C. speculigera*, with Hodgson's species. It is not quite clear that typical examples of the former have ever been compared. Brandt's description, however, agrees very fairly with the Himalayan species.

210. Passer domesticus, (L.)—De F.

1, 2 ♂. Resht, on Caspian Sea	November.
3, 4, 5 ♂, 6 ♀. Forests on Caspian	November.

The birds from Ghílán are the only Persian sparrows I have seen which agree with European specimens, and even they are rather pale.

211. P. Indicus, J. and S.

1, 2 ♂, 3, 4 ♀. Gwádar, Balúchistán	—	Dec. 31.
5 ♀. Dasht, Balúchistán	—	Jan. 26.
6 ♂, 7 ♀. Báhú Kalát, Balúchistán	—	Feb. 1.
8, 9 ♂. Kalagán, Balúchistán	3500	March 11.
10 ♂, 11, 12 ♀. Jálk, Balúchistán	3000	March 17.
13 ♂. Bampúr, Balúchistán	1800	April 4.
14 ♂. Sarján, South Persia	5700	May 29.
15, 16 ♂, 17 ♀. Shiráz	4750	September.
18 ♀. Shiráz	4750	November.
19 ♀. Shiráz	4750	December.
20 ♂, 21 ♀. Bushire	—	February.
22 ♂. Lura valley, Elburz mountains	6500	August 6.

There appears to be in some respects transition in Persia between these two races of sparrows, which are little more than climatic varieties; but all the house sparrows from the plateau and from the southern part of the country agree best with the Indian form, whilst those from the Caspian resemble European specimens. I much doubt if the difference between the two forms justifies separation.

212. * P. montanus, (L.)—De F.

Obtained by De Filippi at the foot of Demavend, north-east of Tehrán. I did not meet with it.

213. P. salicarius, (Vieil.)

1 ♂. Ghistigán, Bampúsht, Balúchistán	3000	Feb. 27.
2 ♂. Sarján, south-west of Karmán	5700	May 29.

This is apparently scarce in Persia, and only two specimens were obtained.

I looked carefully for *P. pyrrhonotus* (Blyth), but had no more success than Mr. Hume in Sind.

214. Petronia stulta, (Scop.)—De F.

1 ♀. Mountains near Shiráz	(?)	July.
2 ♂. Bandámír valley, north of Shiráz	5000	June 23.
3 ♀. Máyín, north of Shiráz	5500	June 24.
4, 5 ♂, 6 ♀. Near Isfahán	7500	March.
7 young ♂. Lura valley, Elburz mountains	7000	August 16.
8, 9 ♀. Lura valley, Elburz mountains	8000	August 18.

I did not meet with this bird to the east of Shiráz. In the mountains between Shiráz and Isfahán it was common, and also in the Elburz north of Tehrán, keeping much to barren and rocky parts of the hills at a considerable elevation, and being usually seen in small flocks.

Mr. G. R. Gray, in his 'Handlist,' gives as one of the synonyms of this species *diadema*, Müll. *Fringilla diadema* of P. L. S. Müller, Linn. Natursyst. Suppl. p. 164, is thus described in German: 'On the forehead of this bird, above the eyes, there is found a pale red and black band, elsewhere it is brown, and lives in Europe.' That is all. The description I should say does not apply to *P. stulta*.

215. P. brachydactyla, (Hemp.)

Bp. Consp. i, p. 513.—Tristram, Ibis, 1868, p. 205, Pl. VI.

1 ♂, 2 ♀. West of Bam, south-eastern Persia	4500	April 27.

3 ♂. West of Bam, south-eastern Persia	5500	April 8.
4 ♀. Near Karmán	7000	May 3.
5 ♀. Near Karmán	6000	May 19.
6 ♂, 7 ♀. Between Bushire and Shiráz	1000	January.
8 ♂, 9, 10, 11 ♀. Shiráz	5000	June.
12 ♂. Dehgirdú, between Shiráz and Isfahán	8000	June 29.
13, 14 young. Near Kohrúd, north of Isfahán	8000	July 17.

Common in many parts of the Persian plateau, apparently descending to lower elevations in the winter, and breeding in summer on plains with scattered low bushes from 5000 to 8000 feet.

My attention was attracted to this bird by its very singular note, which so exactly resembles that of a large cricket that it was some time before I could feel convinced that it really proceeded from a bird. At the time I first heard the note (the end of April) these sparrows were frequently seen sitting on bushes in semi-desert plains, and uttering their singular stridulation. I do not think this peculiarity has been noticed before in print, but Mr. Tristram tells us he observed it on his last visit to Palestine. He was more fortunate than I, for he obtained the bird's eggs, which he described (l. c.), and which are very peculiar.

I have compared my specimens with the types in the Berlin Museum. The latter are from Arabia, and similar to the former in every respect.

The iris is dark umber brown, legs pale yellowish brown; bill dusky above, white below. Dimensions taken on fresh specimens: length 5.75 to 6, expanse 11, wing 3.75 to 3.85, tail 2 to 2.05, tarsus 0.8, bill 0.48, from gape 0.55; wings about 0.7 short of end of tail.

216. Gymnoris flavicollis, (Franklin.)

1, 2, 3, 4 ♂, 5 ♀. Ispidán, east of Bampúr	4500	March 30.
6, 7 ♂, 8, 9, 10, 11 ♀. Near Aptar, east of Bampúr	3500	March 31.
12, 13 ♂, 14 ♀. Bampúr	1800	April 7.
15, 16, 17, 18, 19 ♂. Shiráz	4750	June.

The birds differ in no respect, that I can see, from Indian examples. The species is only found in the drier forests of India, not extending into the damp jungles of the Malabar coast, nor east of the Bay of Bengal; so its appearance in Balúchistán and Southern Persia is less surprising than is the occurrence of such species as *Pratincola caprata*.

G. flavicollis was found abundantly on trees in a ravine through which the road led about forty miles east of Bampúr, at Bampúr itself, and again at Shiráz, but it was not observed in any other locality.

FAMILY EMBERIZIDÆ.

217. Emberiza citrinella, L.

1 ♀. Mountains near Shiráz	8000	July.

This appears to be a rare bird in Persia. I did not myself meet with it, and it does not appear to range further to the south-eastward, although it is found in Siberia. Ménétries records it from Lankorán.

218. E. miliaria, L.—De F.

Cynchramus miliaris, (L.)—De F. Viag. in Pers. p. 349.

1 ♂, 2 ♀. Shiráz	4750	June.
3 ♂, 4 ♀. Near Shiráz	—	September.
5 ♂. Abádeh	7500	July.

All the specimens were obtained by Major St. John: I did not myself procure this species. De Filippi speaks of it as common in the north-western part of the country, and Ménétries obtained it on the Caspian at Lankorán.

219. E. cia, L.

1 young ♂. Elburz mountains, near Tehrán	7000	March.
2, 3 young ♂, 4 ♀, 6 young ♀. Elburz mountains, near Tehrán	6500–8000	Aug. 11–16.

Only one of the specimens enumerated is adult. Besides the above there are two skins collected by Major St. John, the labels of which have been lost. These are probably from Southern Persia, as the species can scarcely be a permanent resident in the Elburz, where I found it very abundant amongst bushes on the hill sides in the middle of August. Ménétries says it is not common on the Tálish mountains.

220. E. intermedia, Michahelles.

Shelley, Birds of Egypt, p. 147, Pl. III, fig. 2.
? *E. Caspia*, Mén. Cat. Rais. p. 41.

1 young ♂. Near Tehrán	3000	March.

From the low country near Tehrán, on the borders of the salt desert. The only specimen procured is immature; the bill is much larger than in *E. schœniclus*, whilst the whole animal is smaller, and the bill much less curved than in *E. pyrrhuloides*.

221. E. striolata, (Licht.)

1, 2, 3, 4, 5 ♂. Báhú Kalát, Balúchistán	—	Feb. 1.
6. Píshín, Balúchistán	800	Feb. 8.
7 ♂. West of Bampúr	1800	April 8.
8 ♂, 9 ♀. Ras Masandim, Arabian coast	—	Dec. 9.

This bird was only found on sandy plains and occasionally on low barren hills near the coast. I never saw it at more than 3000 feet above the sea, rarely above 2000; at lower elevations in Balúchistán it was common, usually (in the winter) in small flocks. Its habits in North-western India have been admirably described by Hume, (Ibis, 1870, p. 399). It appears distinctly a desert form.

222. E. Huttoni, Blyth.—De F.

Blyth, J. A. S. B. xviii, 1849, p. 811.
Emberiza Cerrutii, De F. Archiv. p. l. Zool. Genova, ii, p. 383; Viaggio in Persia, pp. 113, 349.
Glycispiza Huttoni, Gould, Birds of Asia, pt. xxi.

1 ♀. Ispidán, east of Bampúr, Balúchistán	5000	March 30.
2 ♀. North-west of Bampúr, Balúchistán	2500	April 14.
3, 4 ♂. Hanaka, south-east of Karmán	8000	May 2.
5 ♀. Khán-i-súrkh, south-west of Karmán	8000	May 22.
6 ♀. Mountains near Shiráz	—	July.
7 ♂. Dehgirdú, plateau north of Shiráz	8000	June 29.
8 ♂. Mountains near Abádeh, north of Shiráz	—	July.
9 ♂, 10 ♀. Elburz mountains, north of Tehrán	9000	August 17.

I have examined the types of *E. Cerrutii*, De F., two in number, in the Turin Museum. They are unmistakably identical with *E. Huttoni*, Blyth. This species breeds throughout the hills of Persia at a considerable elevation. I almost always met with it wherever the road ascended to 8000 feet above the sea, but I never saw it in summer at lower elevations, and I have no doubt that the birds which are common in parts of North-western and Central India in the winter, breed on the highlands of Afghánistán and Persia. De Filippi's types were from near a village called Sardarak, almost at the foot of Mount Ararat, whilst the specimens originally described by Blyth were collected by Hutton near Kándahár.

I took the nest and eggs of *E. Huttoni* on May the 22nd. The spot was a hillside covered with low bushes, which at this season were tolerably green, close to the caravanserai of Khán-i-súrkh, about 70 miles south-west of Karmán, at an elevation of 8000 feet above the sea. I was walking up the hill amongst the bushes, which grew in close round tufts, so compact that had they not been covered with thorns they would have formed excellent cushions, when a bird, which I at once recognised as Hutton's bunting, flew out of a bush close to me. Lifting up the upper branches, I saw a neat nest about a foot from the ground. The nest appears to have been lost; to the best of my recollection it was of moss, very neatly and compactly made. It contained three eggs, well incubated, which I have preserved. They are very pale green in colour, with small distinct rounded surface spots and minute dots of purplish black and fainter purplish grey markings, the latter being chiefly confined to the larger end. The eggs measure 0.9 by 0.65 inches. I should add, that I shot and preserved the hen bird to guard against error in identification.

It will be seen that in the locality for the nest, and the character of the eggs, this species differs considerably from the ortolan, which lays four or five ashy grey eggs in a nest on the ground. The markings, however, appear similar. The eggs of *E. Huttoni* appear rather larger than those of the ortolan.

223. E. hortulana, L.—De F.

E. shah, Bon. Consp. Gen. Av. p. 465.

1 ♂. West of Bam, south-eastern Persia	6000	..	April 27.
2 ♀. Hanaka, south-east of Karmán ..	8000	..	May 2.
3 ♂. Mountains near Abádeh, north of Shiráz	7500	..	July.

The Persian ortolan was separated by Bonaparte under the absurd title of *E. shah*. My specimens only differ from those obtained in Europe in being a little greyer and less rufous on the back, as so many Persian birds are, and in having the throat and breast marked with dusky spots, which may be due to immaturity. I have no sufficient series of young European specimens for comparison, but I have certainly seen none, with a yellow throat and grey head, so much spotted on the throat and breast as is the Persian male bird shot in April. The only specimen at all resembling it is one from Smyrna in Mr. Dresser's collection, and in this there are streaks on the crown. It is thus possible that *E. shah* may be a distinguishable race. The dimensions of the Persian bird do not differ from those of European skins.

224. **Euspiza melanocephala**, (Scop.)—De F.

? *E. granativora*, Mén. Cat. Rais. p. 40.

1, 2, 3 ♂, 4 ♀. Bampúr, Balúchistán ..	1800 ..	April 14.
5 ♂. Hanaka, south-east of Karmán ..	8000 ..	May 2.
6 ♂. Mashísh, south-west of Karmán	6800 ..	May 20.
7 ♀. Near Sarvistán, east of Shiráz ..	6000 ..	June 5.
8 ♂, 9 young ♂, 10, 11 ♀. Shiráz ..	4750 ..	June.
12, 13, 14 ♂. Kázrún, west of Shiráz	2750 ..	May.
15 young ♂, 16, 17 ♀. Abádeh, north of Shiráz	5000–6000 ..	July.

I should say that Persia must be the principal summer residence and breeding place of the immense flocks of black headed buntings which visit North-western and Central India in winter. When at Bampúr in the beginning of April, these birds were passing by thousands, all coming from the south-east. They roosted for the night in such numbers in the trees by our camp that a shot, almost at hazard, into the tree, brought down ten or a dozen birds. I found these buntings breeding on the plains at about 5000 to 8000 feet, usually in the neighbourhood of cultivation. From their behaviour at Mashísh and other places near Karmán in the middle of May, I have no doubt they were nesting, but although the birds swarmed I could not find the nests. Early in June, the young birds, at a lower elevation, about 5000 feet above the sea, were haunting thick bushes in large flocks. In Northern Persia I saw this bird less frequently, but to the north-west it was found common by De Filippi, Ménétries, and others.

E. granativora, Mén. is probably the young of this species, but the description does not agree very well.

This bird affords the best example I know of migration from north-west to south-east. It is common in summer in the Levant, in Turkey, Greece, and Asia Minor, and is occasionally found in Western Europe; yet it has never been noticed in North-eastern Africa, neither v. Heuglin in the 'Ornithologie N. O. Africa's,' nor Shelley in the 'Birds of Egypt' mentions it. It evidently migrates to the south-eastward. It may, of course, be found in Arabia, but I did not see it in Balúchistán in winter, and its only known winter quarters are in India. In the same way, in summer it does not migrate northward from India. It has never yet been obtained, so far as I know, in Turkestán or in Siberia; it appears to wander to the north-west into Persia, Asia Minor, and Eastern Europe. On a smaller scale similar migration is shown by *Saxicola chrysopygia*, *S. picata* and *Emberiza Huttoni*, and the course of migration of these birds actually crosses, at right angles, that of *Merops apiaster*, *M. Ægyptius*, *Coracias garrula*, and *Saxicola melanoleuca*, which are found in the countries north of India in summer, but do not winter in the Indian peninsula.

[Immense flocks of this bunting breed in the lower plains of Southern Persia, where it is considered a pest only less noxious than the locust, and it is found, though in smaller numbers, throughout the country, which it leaves entirely for the winter.—O. St. J.]

Family CORVIDÆ.

225. Corvus corax, L.—De F.

Kaláh, Persian

1 ♂. Near Tehrán .. .. 4000 .. (?)

Common on the Persian highlands. I saw none in Balúchistán. The specimen obtained by Major St. John measures: wing 17 inches, tail 9.5, tarsus 2.9, culmen 3.15.

Mr. Hume, however, says that he saw on the Makrán coast his *C. Lawrencei*, which I suppose to be a variety of *C. corax*, unless indeed it prove to be *C. umbrinus*, with which the description scarcely agrees.

[The raven is common all over the plateau of Persia, descending to the coast of the Gulf in winter.—O. St. J.]

226. C. umbrinus, Hedenborg.

Sundeval. Kongl. Vetens. Acad. Handl. 1838, p. 198.

1. Chandrakúp, Makrán coast, Balúchistán	—	Nov. 25.
2, 3 ♂, 4 ♀. Gwádar, Makrán coast, Balúchistán	—	Jan. 14.
5 ♂. Ghistigán, Bampusht, Balúchistán	3000	Feb. 29.
6 ♂. Near Kalagán, Balúchistán	3000	March 18.
7 ♂. Near Dizak, Balúchistán	4500	March 25.

I have compared this bird with specimens from Nubia and Egypt in the Berlin Museum, and the only difference is that the Balúchistán skins are rather browner. In this character, however, there is much variation, some having the head, neck, and breast, much browner than others. The species may be recognised at once by this brown colour, and by its rounded tail.

The following are dimensions taken from four specimens, three males and one female, in the flesh: length 21 to 22 inches, wing 14.2 to 15.75, tail 8 to 9, tarsus 2.4 to 2.6, mid-toe and claw 2.1 to 2.15, bill from gape 2.5 in female, 2.7 in males. The wings about reach the end of the tail; the central tail feathers exceed the outer by 1.5 to 2 inches.

This is the only crow of Balúchistán, and is rather a crow than a raven in its habits (according to the manners of Eastern rather than of European members of the genus), being a common scavenger about habitations. Most of the specimens were shot about my camp. It is perfectly familiar and fearless. I thought I once saw the same crow on the Persian plateau, a little east of Shiráz, but I was not certain, and it was certainly very rare.

227. C. cornix, L.

1 ♀. Ráyín, south-south-east of Karmán	7000	April 30.
2 ♀. Shiráz	4750	June.
3 ♂. Kázrún, north-east of Bushire	2750	May.

Common throughout the Persian highlands: keeping generally about towns and villages. It is also abundant at Basrah (Bussora): the birds which I saw in that neighbourhood in December appeared to me very pale coloured, and in the specimen from Kazerún the back is almost isabelline instead of the usual pale cinereous. I never saw the hooded crow in Balúchistán. It extends to Afghánistán, but has not been met with in India.

Ménétries gives *C. corone* amongst the birds found near Lankorán, but it has not been noticed in Persia by any one else.

[The hooded crow is the common crow of Persia, where it remains all the year, never quite deserting the highlands, but leaving the hot plains in spring. The grey feathers have sometimes quite a roseate flush.—O. St. J.]

228. * **C. frugilegus**, L.—De F.

I saw no rooks myself in Persia, nor has any one observed them in Southern Persia. De Filippi shot some at Kazvín.

[I have never noticed the rook south of Isfahán, and there, as at Tehrán, only in winter. A considerable colony breeds in some lofty trees in a garden in the town of Kazvín.—O. St. J.]

229. * **C. monedula**, L.—De F.

I observed no jackdaws in Persia. De Filippi says they are common in the Caucasus and Armenia: rarer in Persia. As they are found in winter in the Panjáb, their entire absence in Persia would be remarkable, but they must be rare, and probably confined to the northern part of the country.

[I have never observed the jackdaw in Persia. If it exists at all it must be in the extreme north-west. In the highlands of Armenia, across the frontier, it is common, and so also in the Caucasus. The cry of the choughs often leads Europeans to call them jackdaws.—O. St. J.]

230. **Pyrrhocorax alpinus**, V.—De F.

1 ♀. Near Kázrún, north-east of Bushire 4000 .. January.

I did not myself see the Alpine chough, but it was observed by De Filippi, who says it is common on the slopes of Demavend, the high volcanic cone north-east of Tehrán. Its presence in Southern Persia is, however, rather surprising.

231. P. graculus, (L.)—De F.

1 ♀. Near Niríz, east of Shiráz	5000	June 4.
2 ♂. Abádeh	6000	June.
3. Elburz mountains	(?)	January.
4. Elburz mountains	(?)	February.

Common in many of the Persian hills. I met with it first between Bampúr and Narmashír in April, at not much more than 4000 feet above the sea, and thence saw it here and there throughout the country, by no means keeping always to the highest elevations, for I saw many in June at a place barely 5000 feet above the sea level. Indeed, to the north they appeared to range higher than to the south, keeping to the higher parts of the Elburz for instance.

[*P. graculus* is very common in Western Persia in suitable localities, and keeps in immense flocks. I have never seen it in the lower valleys. *P. alpinus* is certainly much less common. The only time I have seen it was when the specimen in the collection was obtained on the Kotal-Doktar pass, between Bushire and Shiráz, 4000 feet above the sea.—O. St. J.]

232. Pica rustica, Scop.—De F.

P. caudata, auct.
P. Bactriana, Bon. Consp. Gen. A. p. 383.
Zági, Persian.

1, 2 ♂. Ráyin, south-east of Karmán	7000	April 30.
3, 4 ♂, 5, 6 young ♂, 7 young ♀. Shiráz	4750	June.
8 ♂, 9 ♀. Shiráz	4750	(?)

Mr. Dresser, in the 'Birds of Europe,' has lately shown, from an examination of a large series, that *P. Bactriana* and several other names are synonyms of *P. rustica*, and so far at least as *P. Bactriana* is concerned I agree with him.

There appears to me to be in all probability but one magpie in Persia, which is found throughout the highlands. I did not see it in Balúchistán, even in the hills, though it is, I am told, common in Kelát.

[I have seen magpies with rumps of every shade of colour from brownish grey, to white. They breed as low down as Kázrún, 2800 feet only above the sea, in 29° to 30° latitude N.—O. St. J.]

233. Garrulus atricapillus, Geoff.

Bálút Khor (Acorn-eater), Persian.

1, 2 ♂. Oak forest, near Shiráz .. 4000-7000 .. June.

The specimens obtained are peculiarly pale, and the plumage is worn and faded. For an account of the different black-headed jays see Dresser's 'Birds of Europe.'

The present form is only known in Persia to inhabit the forests of Fárs. Mr. Dresser suggests that the *Garrulus glandarius* of Ménétries, found at Lankorán and on the Tálish mountains, may be *G. Krynicki*, which is a common species in the Caucasus, but, as I think it at least equally likely that the bird noticed by Ménétries is the next species, *G. Hyrcanus*, which in all probability ranges thus far to the westward, I shall not include *G. Krynicki* in the Persian list. It is, however, I should think, the species met with by De Filippi in the Transcaucasian provinces, and it may very possibly be found in the extreme north-west of Persia, even if not in Ghílán. It is distinguished from *G. atricapillus* by its greyer back, by having the forehead spotted with black, and much less white on the secondary quills.

[This jay is very numerous in the oak forests of Fárs, and is occasionally to be found in the wooded beds of the Polvár and other affluents of the Kúr or Bandámír, but no further north.—O. St. J.]

234. G. Hyrcanus, W. Blanford, Pl. XVIII.

Ibis, 1873, p. 225.

1, 2 ♀. Anán, Elburz mountains, Mazandarán 6500 .. August 12.
3 ♂, 4. Elburz mountains .. .. .. (?) .. February.
5, 6 ♂. Mazandarán .. .. .. (?) .. (?)

G. *affinis* G. glandario, *sed minor ; tarso breviore ; pilei plumis nigris anguste rufescenti- vel rufo-schistaceo marginatis, haud albido ; gulá isabelliná in colorem saturatiorem pectoris gradatim transeunte, remige secundario penultimo et plerumque antepenultimo maculá ferrugineá magná ad pogonium externum signatis. Long. alæ* 6.5, *caudæ* 5.2, *tarsi* 1.6, *culminis* 1.42.

Hab. in sylvis Hyrcaniæ, hodie Mazandarán dictæ in parte septentrionali regni recentis Persici haud procul a littore maris Caspii.

Head above black, the feathers with narrow rufous edges, which are isabelline towards the forehead, rufous slaty behind, never white as in

G. glandarius and *G. Japonicus*, but rather resembling those of *G. Brandti;* sides of head pale rufous, the ear coverts being decidedly paler than the back. There is a black patch at the base of the lower mandible, extending a short distance down the side of the throat, but not on to the lores. Hind neck and back vinaceous with a grey tinge, upper tail coverts white. Tail brownish black; the central feathers, and the outer webs of some of the others, with imperfect narrow bluish grey tranverse bars near the base. Quills brownish black; all the primaries, except the first, with broad white margins; basal portion of outer web of secondaries, except the four nearest the body, white, with a blue spot at the further end of the white portion, and blue bands near the base; last secondary but three (or four) with blue, black and white bands near the base of the outer web[1]; the last three with an increasing amount of ferruginous brown, restricted to the outer web in all but the last, in which it extends over both webs, and only the tip of the feathers is black. Wing coverts as in *G. glandarius*, those of the primaries banded blue and black. Chin and throat rufous white, passing gradually into the rufous of the breast and abdomen, which are nearly the same colour as the back. Vent and lower tail coverts white.

This jay is common in the hill forests north of the Elburz, where specimens were obtained by both Major St. John and myself.

[This new jay was obtained by my collector in the forests of Mazandarán in winter. I have myself seen it in the oak woods of the same province at an altitude of 5000 to 6000 feet, and in the neighbouring province of Ghílán in the lower hills, but did not observe it in the low forests between the mountains and the sea.—O. St. J.]

Family STURNIDÆ.

235. Sturnus vulgaris, L.—De F.

1 ♀, 2, 3 (?). Gwádar, Balúchistán	—	December.
4, 5 young. Near Niríz, east of Shiráz	5000	June 4.
6 ♀. Shiráz	4750	June.
7, 8 ♂, 9, 10 ♀. Shiráz	4750	(?)
11 ♂. Resht, Ghílán, near the Caspian	—	(?)

Not rare in Persia. It breeds even in the south.

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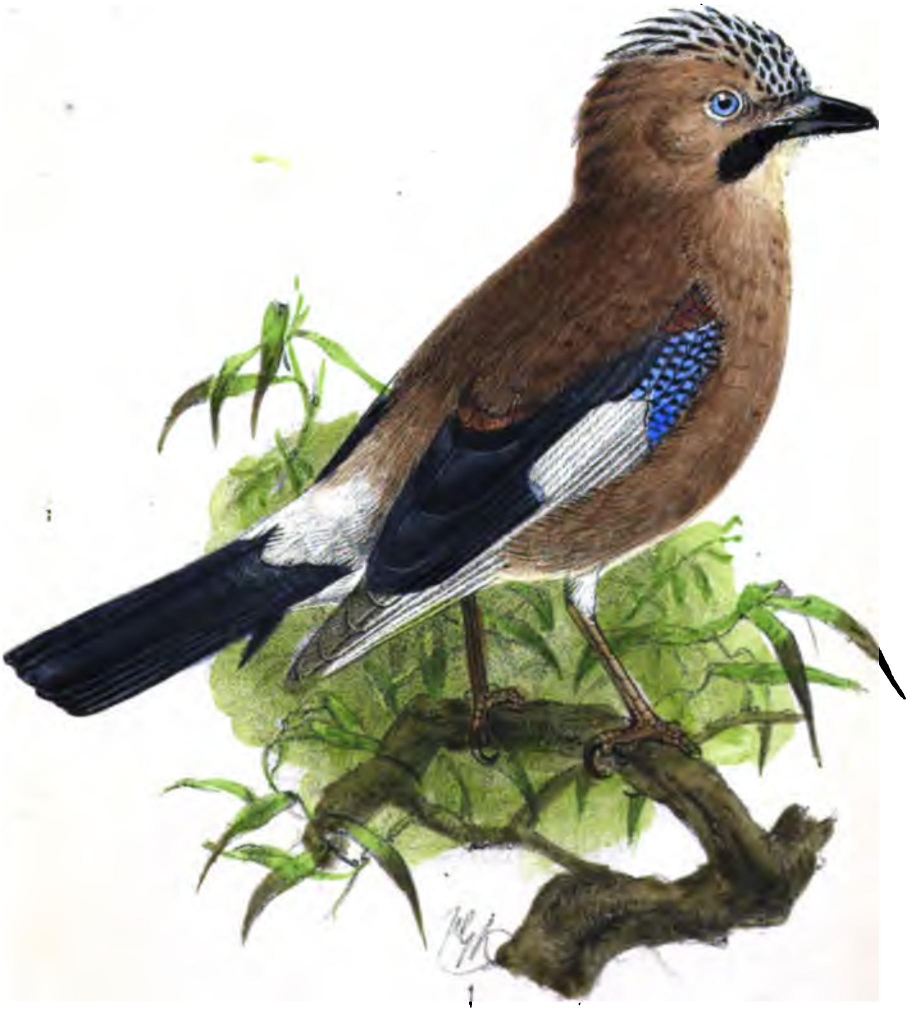
[1] In one specimen this is the case in the fifth secondary from the proximal end of the wing, the fourth being blackish brown throughout, and this specimen was described in the 'Ibis.' This arrangement appears exceptional; the common form is that now described.

Pl XVIII
Zoology of Persia.



2

Keulemans del.

Mintern Bros lith.

GARRULUS HYRCANUS

236. S. sp. (*? S. vulgaris*, var.)

Sturnus nitens, Brooks, Proc. As. Soc. B. 1871, p. 210.—Hume, Ibis, 1871, p. 410; Lahore to Yarkund, p. 250, Pl. XXIV, nec Brehm. Vög. Deutschl. p. 399, (1831).

1, 2 ♂. Shiráz	.. ..	4750 ..	June.
3 ♂. Jáji Rúd valley, Elburz mountains		7000 ..	August 6.

Mr. Dresser, in the 'Birds of Europe,' considers that *S. nitens*, Brooks and Hume, is very possibly nothing but an old *S. vulgaris*. I do not think the differences pointed out by Mr. Hume in the shape of the bill are constant, and although the eastern birds are rather smaller than European, the difference is trifling. But at the same time Mr. Dresser tells me he has never seen European birds absolutely unspotted as are the skins I refer to the present form. I therefore keep the two distinct, but the name *nitens* cannot be maintained, as it was applied by Brehm to a German bird.

S. purpurascens, Gould, is called the Persian starling by its describer, and the locality in Mr. G. R. Gray's Handlist, ii, p. 22, is said to be Persia. The bird, however, has hitherto only been brought from Erzerúm, in Armenia. The Cashmere bird, supposed to be the same by Mr. Gould, proves distinct.

[The spotted stare is common all over Persia, frequenting the high bare plateaux during summer in large numbers. *S. nitens* seemed to be confined to wooded and garden districts.—O. St. J.]

237. * Acridotheres tristis, (L.)

Not very common in the few villages of any size which were traversed near the coast of Balúchistán. As usual it was only observed near houses, and it was not noticed inland.

238. * Pastor roseus, (L.)—De F.

It is simply a startling fact that this bird appears to be utterly unknown throughout Persia, except in the extreme north-west and in Mesopotamia. That it is found in the winter months almost all over India in myriads, that it leaves the Indian peninsula and its neighbourhood during the summer months, that it has never been observed at that period in the Himalayas, the countries north of the mountains, China or Siberia, and that it breeds in Asia Minor and South-eastern Europe are facts as well known as anything can be. Now to get to Asia Minor from India, and *vice versâ*, the most direct road is across Persia; but I certainly never saw any rose-coloured starlings migrating in the spring of 1872, and Major St. John, during several years' residence in various parts of Persia, has never seen this bird. That the birds which breed in Western Asia go to India in the winter seems almost certain, because they are unknown in Northern Africa, and I have no doubt that this is a simple case of north-west and south-east migration, as with *Euspiza melanocephala*, but the route followed is a mystery. If they go round the coast, and up the Persian Gulf, they should be looked for at Bushire about the beginning of May[1]. De Filippi found this bird abundant in Armenia, the Caucasus, and Western Persia (? Adarbaiján), but he noticed that it became rarer to the east. Ménétries does not mention it. On the other hand, Ollivier noticed it near Bághdád, and Chesney has recorded its presence in Mesopotamia.

[I have heard of the occurrence of this bird in large flocks about Tabriz, but have never seen it myself in any part of Persia.—O. St. J.]

COLUMBÆ.

Family COLUMBIDÆ.

239. * Columba livia, Bp.—De F.

240. C. intermedia, Strickland.

1. West of Bam, south-eastern Persia 5500 .. April 26.

I am sorry to say that I did not note the range of these two races in Persia. Both certainly occur, and, so far as I observed, the common form in the south appeared to be ***intermedia*** with the ashy rump. Certainly the only specimen preserved belongs to that race, and I know that others were shot. Hume obtained both in Sind.

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[1] Jerdon says they leave Southern India in March, but remain in the north a month or so longer. I have seen them in Central India as late, I think, as the middle of April. They arrive at Smyrna about the 15th of May. For a full account consult Dresser's 'Birds of Europe.'

Pigeons are common in the wells and underground water channels or kánáts, made for irrigation throughout Persia; but at the time of my journey the immense numbers which usually haunt the great pigeon towers about Isfahán and other parts had completely disappeared. All had died or been killed during the famine. Indeed, I saw comparatively very few pigeons throughout Central and Northern Persia.

241. * C. œnas, L., (? *C. Eversmani*, Bp.)

I did not myself notice stock doves in Persia, but Major St. John informs me that he has shot them on the Persian plateau. They belong probably to the eastern race.

Both De Filippi and Ménétries obtained *C. œnus* in the Caucasus.

Pallas, who, following Linnæus, includes *C. œnas* and *C. livia* in one species, to which he applies the former name, states that the pigeons of Russia leave in large flocks in autumn for the warmer parts of Persia. The pigeons which thus migrate are probably *C. œnas*, which is a migratory bird in Europe, and not *C. livia.*

[Shooting one winter in the neighbourhood of Mashad-i-Múrghát, the ancient Pasargardæ, I shot a pigeon which seemed to correspond exactly with the description and figure of the stock dove in Yarrell, and I afterwards got one on the Kárá-agatch river.—O. St. J.]

242. * C. palumbus ?, L.—De F.

243. C. casiotis, Bp.

1 ♂, 2 young ♀.	Oak forest, near Shiráz	6000 ..	June.

Woodpigeons abound in the better wooded parts of Persia, both in the Caspian and Elburz forests, and in the oak clad hills near Shiráz. I have specimens from the latter locality alone, and the only adult has the buff neck patch characteristic of *C. casiotis*. The dimensions are: wing 9.9, tail 6.5.

I saw many woodpigeons, both near Shiráz and again north of the Elburz in Mazandarán and Ghílán, but unfortunately could obtain none. I have occasionally seen them also in gardens containing large trees near the higher villages, as at Ráyín, near Karmán. Those in the Caspian provinces are called *C. palumbus* by De Filippi, and as they may possibly differ from the southern birds and resemble the European race, I retain the name. Specimens from Bághdád in the British Museum have a pure white neck patch and unquestionably belong to *C. palumbus.*

244. Turtur auritus, Gray.—De F.

1 ♂. Near Bam, Narmashír, south-eastern Persia	.. ..	2500 ..	April 19.
2 ♂. Khán-i-súrkh, south-west of Karmán		8500 ..	May 22.
3, 4 ♂. Near Shiráz	.. .. ..	5500 ..	(?)
5 ♀. Near Shiráz ..	.. .. ..	(?) ..	July.
6 ♂. Oak forest, near Shiráz	.. ..	(?) ..	June.

This, the European turtle dove, is common throughout Persia. I never saw it in Balúchistán, but I met with it immediately after entering Narmashír, and thence to the north it was to be found wherever there were trees. It was common in the Elburz mountains.

I saw no other species of dove on the plateau.

245. T. risorius, (L.)

1 ♀. Píshín, Balúchistán	.. ..	600 ..	Feb. 10.
2 ♂. Magas, Balúchistán	.. ..	4000 ..	March 29.

Only seen in Balúchistán.

Pallas refers to the asserted occurrence of this dove in Ghílán, Zoogr. Ros. As. i, p. 564, but suggests that *T. auritus* may have been mistaken for it. Major St. John informs me that he once saw a pair in captivity at Isfahán, which, he was told, had been taken from a nest in a garden there.

246. T. Cambayensis, (Gm.)

1 ♀. Báhú Kalát, Balúchistán	..	Sea level ..	Feb. 2.
2 ♂. Near Kalagán, Balúchistán	..	4000 ..	March 19.
3 ♀. Bampúr, Balúchistán ..	..	2000 ..	April 5.

Like the last, this was only observed in Balúchistán.

247. * ? T. Senegalensis, (L.)

Eichwald includes *Columba maculicollis,* Wagler, and *C. Ægyptiaca,* Lath., both of which names apply to *T. Senegalensis,* L., amongst the pigeons which he says inhabit the west shore of the Caspian, from Persia to Astrakhán.

GALLINÆ.

FAMILY PTEROCLIDÆ.

248. Pterocles arenarius, (Pall.)—De F.

Síyá Sínah (Black-breast), Persian.

1 ♂. Sarján, east of Shiráz	5800 ..	May 28.
2 ♂. Shiráz	4750 ..	July.
5 ♀. Near Shiráz	(?) ..	July.

This is the common sandgrouse of the Persian plateau. It especially abounds on the large semi-desert plains, cultivated only where water is available for irrigation, in Southern Persia. It is usually met with, in April, May, June, and July, singly, or in parties of not more than three or four, and in the morning about eight o'clock, and again in the evening an hour or two before sunset, these birds may be seen flying to the water to drink, as is usual with all forms of the genus, uttering their peculiar note as they fly.

I obtained the eggs near Niríz, east of Shiráz, on the 4th of June. Three were brought to me by one of my servants, and, although I did not see the bird, I have no hesitation in referring them to this species, for they are unmistakably the eggs of *Pterocles*, and of one of the larger forms, and the present was the only species seen in the country. The eggs in question were well incubated and measure 1.8. in. by 1.25.

249. * P. alchata, (L.)—De F.

Tetrao caudacutus, S. G. Gmel. Reise, iii, p. 93, Pl. XVIII.
T. chata, Pall. Zoogr. Ros. As. ii, p. 73.
Kao-Kár, Persian.

So far as I know, I did not once see the large pin-tailed sandgrouse, and I doubt if it breeds in Southern Persia. Major St. John informs me that he has seen it near Bushire in winter, and it has been noticed by De Filippi and others in Northern Persia.

250. P. Senegallus, (L.)

Hume, Stray Feathers, i, p. 221.
Tetrao Senegallus, Linn. Mantissa, p. 526.
Pterocles guttatus, Licht. Verz. Doubl. p. 64.

1 ♂, 2 ♀. Bampúr, Balúchistán ..	2000 ..	April 6.

This does not appear to be so common in Balúchistán as in Sind.

Sand grouse of all kinds appear less abundant in Balúchistán than I should have anticipated, far less so than they are in Sind, where they absolutely swarm in many places. On the Persian highlands I did not obtain *P. Senegallus.*

251. **P. coronatus**, Licht.

Hume, Stray Feathers, p. 224.

1 ♂. Samán, Dasht, west of Gwádar, Balúchistán	—	.. Jan. 30.
2, 3 ♀. Báhú Kalát, Balúchistán ..	—	.. Feb. 4.
4 ♀. Kátrú, between Karmán and Shiráz	5000	.. May 31.
5 ♂, 6 ♀. Yazdikhást, between Shiráz and Isfahán	7000	.. July 1.

This appeared to me more common in Balúchistán than *P. Senegallus.* It has been found in Sind, but rarely, whilst *P. Senegallus* is there common.

I only met with the smaller sandgrouse at rare intervals on the Persian plateau, and the few killed belonged to this species.

P. exustus must be found in Balúchistán, though I did not meet with it, and *P. Lichtensteini*, which has been procured both in Arabia and Sind, may also be expected to occur occasionally.

Family PHASIANIDÆ.

252. **Phasianus Colchicus**, L.—De F.

Kargowal, Persian.

1 ♂. Resht, near Caspian Sea.

The common pheasant, as is well known, abounds in the Caspian forests.

[Extends through the forest region of Mazandarán as far east as the upper valley of the Gurgán. Travellers have recorded it from the jungles of the Harirúd valley, but do not appear to have seen it.—O. St. J.]

FAMILY TETRAONIDÆ.

253. * Perdix cinerea, (L.)—De F.

[The common partridge is found all over Adarbaiján, possibly extending through the Elburz as far east as Tehrán. Taimúr Mirza, the Shah's grand falconer, assured me that this bird is found in the Lura or Karij valley, due north of that city.—O. ST. J.]

254. Francolinus vulgaris, Steph.—De F.

Durráj, Persian.

1 ♂. Dasht river, west of Gwádar, Balúchistán.	Sea level	..	Jan. 26.
2 ♂. Báhú Kalát, west of Gwádar, Balúchistán.	Sea level	..	Feb. 4.
3 ♂, 4 ♀. Khist, north-east of Bushire ..	1800	..	January.
5 ♂, 6 ♀. Basrah (Bussora), Euphrates valley	Sea level	..	Dec. 17.

I only met with the francolin in the better wooded parts of Balúchistán, up to an elevation of about 2000 feet, and on the banks of the Shat-el-Arab, near Basrah (Bussorah). It occurs, I believe, in places all along the coast of Southern Persia, and also on the Caspian.

[The common francolin is found in the warm plains of Southern Persia, and the damp forest regions of the Caspian, but not very abundantly in the latter. The northern limit is about Lankorán. West of our region it is found in great numbers in the tamarisk jungles and reed beds of Mesopotamia. *Pterocles arenarius* and *Francolinus vulgaris* are confused by Mounsey and other writers under the name of Durráj.—O. ST. J.]

255. * Ortygornis Ponticeriana, (Gm.)

Jiráfti, Persian.

Common in Balúchistán and found throughout the eastern part of the lowlands or '*Garmsir*' of Southern Persia.

[The Indian grey partridge is confined to the south of Persia proper, but is probably found in the Helmund valley also; the extreme western limit appears to be Lár. The Persian name is taken from the jungly plain of Jirúft, north of Bandar Abbás, where this partridge is very abundant.—O. St. J.]

256. Ammoperdix Bonhami, G. R. Gray.—De F.

A. griseogularis, Brandt.—De F. Viag. in Persia, p. 351.
Tíhú, Persian.

1 ♂, 2 ♀. Near Báhú Kalát, Balúchistán	Sea level	Feb. 4.
3 ♂. Píshín, Balúchistán	700	Feb. 6.
4 ♂. Niríz, east of Shiráz	5000	June 5.
5 ♂. Kázrún, west of Shiráz	1500	May
6 ♂. Parpá, 150 miles east of Shiráz	7000	May 30.
7, 8 ♂. Shiráz	4750	June.

The three last specimens are pale rufous, with the same general colouration on the back as *A. Heyi*, but they have a differently coloured head and white markings on the side of the neck, which are wanting in the western species. The latter may possibly occur in Mesopotamia.

The *Tíhú* is found everywhere in Persia, except the forest regions, from the sea level to at least 7000 feet above the sea in Southern, and not much less in Northern Persia. They keep much to low hills and stony ravines about the base of hill ranges. During the spring and summer they are found in pairs or singly, in the winter they are occasionally to be met with in small coveys, but by no means so frequently as *Caccabis*, nor do they collect, as far as my observation extends, in equal numbers. They may usually be seen walking quietly up stony hill sides, not running so swiftly as most partridges, nor caring much for concealment; indeed when they wish to hide it is sufficient for them to remain still, for their colour so closely resembles that of the sand and stones around that they are most difficult to detect. When they rise it is much like a quail, with a rather quick flight and a whistle uttered as they start. Their ordinary call is a double note repeated several times. They are excellent eating, far superior to the dry *Caccabis*, and only second, if they are second, to the francolin.

Hume has given a full account of the colouration of soft parts and measurements (Stray Feathers, i, p. 226) with which my notes agree.

257. Caccabis chukar, Gray, var.—De F.

Tetrao rufa, Pall. Zoogr. Ros. As. ii, p. 79, nec Linn.
Caccabis pallidus ?, Hume, Lahore to Yarkund, p. 283.
Kabk, Persian.

1 ♀. Kalagán, Balúchistán	3500	March 18.
2, 3 ♀, 4 young. Near Shiráz	6000	(?)
5 young ♀. Near Shiráz	6500	July.
6 ♀. Imámzádeh Ismail, north of Shiráz	6000	June 26.

I am quite at a loss for a name for the Persian red-legged partridge. Besides the two European races, *C. saxatilis* and *C. Græca*, and the chukár of Northern India, Mr. Hume, in 'Lahore to Yarkund,' has just named three other Asiatic races, two from the country north of the Himalayas, and one from Aden in Arabia. Two forms of this bird are found in Persia, neither of which, so far as I can see, exactly agrees with any described variety. As, however, it is clear that to give a name to every local race will only tend to confusion, I shall leave those from Persia without any special name. It appears very probable that all these forms pass into each other and that there is really but one species. Still the Central European race, *C. saxatilis*, Meyer, as is shown by Degland and Gerbe, appears to be always distinguished by having the anterior portion of the lores black, so that the black of the forehead is joined to the spot at the base of the mandible on each side. In all Asiatic specimens, the lores are white throughout; and for the present I think it best to consider all Asiatic races as varieties of *C. Chukar*.

The common *Kabk* of the Persian highlands is a small pale coloured race, the colour of the back, even when freshly moulted, being decidedly paler than in the Indian chukár, and fading in the worn plumage to a pale sandy rufous. The tint of the head above and of the hind neck is very light grey, the superciliary region and the area above the ear coverts together with the throat becoming very nearly white. The rump, upper tail coverts and rectrices are pale ashy, with a more or less distinct rufous tinge, outer rectrices dull ferruginous, breast light grey, abdomen and lower tail coverts isabelline or very pale rufescent, the feathers of the flanks light grey at the base, the two black bands usually but not always equal in breadth, the space between them with a more or less rufous tinge, tips of the feathers ferruginous. Markings on the wings as usual, the scapulars being grey at the base with pinkish ferruginous outer edges, primaries hair brown, the lower part of the outer web buff, secondaries and coverts light brown with an olive tinge.

The birds above described are all in worn plumage, corresponding pretty well with that of the forms described as *pallidus* and *arenarius* by Hume (Lahore to Yarkund, pp. 283, 284), but the bird shot at Kalagán in March has rather the colouration of Mr. Hume's *C. pallescens*, being darker and more olivaceous, though still paler than Himalayan and Syrian skins. It measured when fresh: length 13 inches, wing 5.7, tail 3, tarsus 1.7, bill from gape 1. The bill from the forehead measures 0.77, anterior edge of nostril to tip of bill 0.53. Specimens from near Shiráz measure: wing 6.25, tail 3.25 to 3.4, tarsus 1.65 to 1.75, bill from forehead 0.8 to 0.9, from anterior edge of nostril 0.55 to 0.58.

In the British Museum are two specimens brought by Loftus from Mesopotamia, corresponding closely in colour with those from the Persian highlands, but larger. They have received a MS. name from Mr. G. R. Gray, which however he has not published. They measure: wing 6.4 and 6.7, tail 3.65 and 3.9, tarsus 1.85 and 2, bill from front 0.9 and 1, from anterior edge of nostril 0.54 and 0.6.

This bird is widely distributed in Persia, at all elevations up to 10000 feet, keeping to hills, especially those covered with small bushes, and often found in large coveys. I have seen at least twenty together in August on the Elburz. The flesh is usually rather dry and less well flavoured than that of other partridges.

[This is the common partridge of Persia, and I have shot it at all elevations from 10000 feet in the Elburz to the base of the hills near Bushire. The race found in the south is, I think, decidedly larger than that of the Elburz. In the wild moorland country which fringes the oak forests of Fárs on the north, it is especially abundant. I have killed twelve and a half brace before breakfast in September near the Khán-i-zinián caravanserai, twenty-five miles west of Shiráz. Contrary to what is recorded of its habits in the Himalayas, it avoids cultivation in Persia.—O. St. J.]

258. * Tetraogallus Caspius, (S. G. Gmel.)—De F.

Tetrao Caspius, S. G. Gmel, Reise, p. 67, Pl. X.
Tetraogallus Caucasicus, (Pall.), De F. Viag. in Persia, p. 351.
Kabk-i-dareh (the glen-partridge), Persian.

Found in small flocks on many of the higher ranges, keeping always at considerable elevations. It is known from the Elburz, the mountains of Kúrdistán, and some of the higher ranges near Shiráz.

Herr Radde, of Tiflis, assured me that the Caucasian bird *T. Caucasicus* (Pall.) is distinct. The Elburz bird is the typical *Tetrao Caspius* of Gmelin, who procured his specimen near Astrabád.

The asserted Persian locality for *Tetrao Scoticus*, var. *Persicus*[1], (*Lagopus Persicus*, G. R. Gray, Gen. of Birds, Pl. CXXXIII,) must, I think, be due to some mistake. The type specimen in the British Museum is labelled from Kaiparriah, (I do not know where this place is,) and the Turkish name is said to be 'Guizel' or 'Kunalee.' The specimen is very pale. On the stand in the British Museum is a note in pencil giving the Turkish name quoted above, and stating that the bird is common at the locality. There is, however, no indication by which the origin of the specimen can be traced. In the Catalogue Brit. Mus. Gallinæ, p. 91, it is said to be from Mr. Warwick's collection.

Can the locality be Kaisaríah (Cæsarea) in Asia Minor? As I have frequently had occasion to notice, some English ornithologists, not many years since, considered Armenia as part of Persia, and the district of which Cæsarea is the chief town, the ancient Cappadocia, is sometimes called Turkish Armenia.

Newton, Ibis, 1865, p. 345, and Elliot, Mon. Tetraon., Pl. XX, unhesitatingly refer this bird to *L. Scoticus*. If this be the case, of course the locality and the Turkish names are due to somebody's inventive faculty, before the specimen reached the Museum. I cannot help suggesting the bare possibility of this bird being a variety of the willow grouse, which might, perhaps, be found on the cold upland plains of Armenia[2]. In any case there is no evidence of its being from Persia.

[It is not impossible that there are two species of *Tetraogallus* in Persia, as one is said by natives to be found in the lofty Dinár mountains north of Shiráz, which have not yet been visited by a European. In the Elburz the Kabk-i-dareh is far from common, and appears to be confined to the bare southern slopes, so that 'Caspius' is rather a misnomer.—O. St. J.]

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[1] Gray, Handlist, ii, p. 277.

[2] Since the above was written I have seen a specimen of this bird (*Lagopus albus*) obtained from the neighbourhood of Tiflis by Mr. Howard Saunders. This renders its occurrence in Armenia probable.

259. * Coturnix communis, Bonn.—De F.

Common in all cultivated fields during the time the crops are green : it leaves the Persian highlands in winter, resorting to India.

I heard quail calling in the green crops at Bampúr at the beginning of April, at less than 2000 feet above the sea, at about 5000 to 6000 feet in May, and at Kohrúd, between Isfahán and Tehrán, 7000 feet above the sea, in the middle of July, and I have no doubt but that they breed at different times according to the elevation.

GRALLÆ.

Family CHARADRIADÆ.

260. Charadrius pluvialis, L.

1 ♂. Gwádar, Balúchistán	Sea level	December.
2. Near Resht	Sea level	November.

Both the specimens have white axillaries, and consequently clearly belong to the European golden plover, which has not hitherto been recorded so far to the east as Balúchistán. It will probably, I think, be found in North-western India. Mr. Hume records *C. fulvus*, Gm. from Sind, but he was not able to examine specimens, and the bird may perhaps have been *C. pluvialis*.

261. Squatarola Helvetica, (L.)

1 ♂. Gwádar, Balúchistán	Sea level	December.

Not observed elsewhere, but, of course, found on the Caspian.

262. Eudromias morinellus, (L.)

1 ♀. Kázrún, west of Shiráz	2750	January.

The dotterel has not before been found so far to the south-east, so far as I am aware.

263. * E. Asiaticus, (Pall.)—De F.

E. Caspius, (Pall.), De F. Viag. in Persia, p. 351.

De Filippi obtained this species on the Caspian at Enzeli, and it was recorded by Pallas from the shores of the same sea (Zool. Ros. As. ii, p. 136).

264. Ægialitis Mongolicus, (Pall.)

Charadrius Mongolus, Pall. Reise, Russ. Reich. iii, p. 700.

1. Persian Gulf	December.

I obtained this specimen, I think, at one of the gulf islands, either Angám (Henjám) or Kishm, but did not note which on the label. Hume procured it from the Makrán coast.

Æ. Geoffroyi must also occur on the southern coast of Persia and Balúchistán, but I obtained no specimens, nor apparently did Hume, although he found it abundant at Karáchí, and it is common both on the shores of India and in the Red Sea.

Neither of these shore plovers appears to have been obtained on the Caspian.

265. Æ. cantianus, (Lath.)

1, 2 ♂, 3, 4 ♀. Gwádar, Balúchistán ..	Sea level ..	December.
5 ♂. Máshkíd river, near Isfandak, Balúchistán	3300 ..	March 8.

Apparently not common on the Persian plateau; more so on the sea coast, and near the Caspian. De Filippi obtained it at Sultániah, between Tabriz and Kazvín.

[Rare. I once procured one near Yazdikhást in May.—O. St. J.]

266. Æ. fluviatilis, (Bechst.)—De F.

1 ♂. Máshkíd river, near Isfandak, Balúchistán	3300 ..	March 8.
2, 3, 4 ♂, 5, 6, 7 ♀. Near Kalagán, Balúchistán	4000 ..	March 10–19.
8 ♂, 9 (?). Near Tehrán	5000 ..	March 28.
10 ♂. Near Resht	Sea level ..	November.
11 ♂. Near the Caspian	— ..	November.

I saw a small *Ægialitis*, probably this species, on the borders of the Shiráz lake in June, so it probably breeds on the plateau. De Filippi found it common in the summer on the sandy beds of streams in Northern Persia.

267. * ? Æ. hiaticula, (L.)

Mr. Gray (Handlist, iii, p. 15) gives Persia amongst the localities for this species.

268. * Æ. intermedius, (Mén.)

Charadrius intermedius, Mén. Cat. Rais. No. 189, p. 53.

This small race of *Æ. hiaticula* was described by Ménétries from specimens obtained at Lankorán.

269. Vanellus cristatus, Meyer.—De F.

1, 2 ♀. Resht, near Caspian Sea	Sea level	November.

I saw no lapwings in Balúchistán, in Southern Persia, or on the plateau, but they abounded in the plains of the Euphrates valley, near Basrah, in December. De Filippi met with some at Sultániah, a high plain south of Tabriz, in July; so they probably breed in the higher parts of North-western Persia.

[Breeds in the marshes about Asupás, north of Shiráz, and similar localities. Common everywhere in winter.—O. St. J.]

270. Chettusia Villotæi[1], (Audouin).

Charadrius leucurus, Licht., Eversm. Reise n. Buch. p. 137.
C. flavipes, auct.

1 ♀. Jálk, Balúchistán	3000	March 14.
2 ♂. Rígán, Narmashír	2500	April 17.
3 ♂, 4 ♀. Near Bam	3000	April 20.
5 ♀. Shiráz lake	4700	June 8.
6 ♀. Shiráz	4750	June.
7 ♂. Near Shiráz	6000	September.

Common in Southern Persia and Balúchistán in suitable localities, but I did not meet with it in the north, nor does it appear to have been recorded from the Caspian, though described by Lichtenstein from near Bokhara. I saw a large number about the lake of Shiráz early in June, and they appeared to me as if they had nests in some marshes on the edge of the lake, but the places were quite inaccessible on account of deep mud.

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[1] See Shelley, Birds of Egypt, p. 233.

271. Lobivanellus Indicus, (Bodd.)

1 ♀. Askán, Bampúsht, Balúchistán	3500	March 6.
2 ♂. Sib, near Dizák, Balúchistán	4500	March 25.
3 ♂. Near Sarvistán, east of Shiráz	6000	June 5.

I was rather surprised to meet with this plover so far to the westward as the neighbourhood of Shiráz. It was very rare; indeed this was the only occasion on which I recollect seeing it on the plateau. In Balúchistán it was by no means common.

272. * Hoplopterus spinosus, (L.)

Charadrius Persicus, Bonnaterre, Tabl. Enc. i, p. 21.

This bird is given from Persia by Bonnaterre and Brisson (Ornithologie, v, p. 84), who called it 'le Pluvier Hupé de Perse.' Their authority was probably Edwards, who states, Nat. Hist. i, p. 47, that this bird, which he figures, was sent to him from Gambron (Bandar Abbás), in Persia, by Mr. Peter Colinson. As there is every probability that the species is Persian I include it.

273. * Strepsilas interpres, (L.)

Noticed by Hume on the Makrán coast.

274. Hæmatopus ostralegus, L.

1 ♀. Hormuz Island, Persian Gulf	December 10.

Occasionally seen along the coasts of the Persian Gulf and Balúchistán. It is also found on the Caspian.

Dromas ardeola probably inhabits the Persian Gulf, but I did not see it.

275. Cursorius Gallicus, (Gm.)—De F.

1 ♂. Gwádar, Balúchistán	Sea level	November.
2 ♀. Sáadatabád, south-west of Karmán	6500	May 23.

Not common, but noticed now and then throughout the country.

276. Glareola pratincola, (L.)—De F.

1 ♂, 2 ♀. Shiráz .. .. 4750 .. June.

The pratincole appears rare in Southern Persia; I did not meet with it. De Filippi observed it near Sultániah and Sainkala, north-west of Kazvín. Eichwald and Ménétries also saw it on the Caspian, and the former mentions two species which he calls *G. Austriaca*, L., Gm. and *G. torquata*, Meyer, one of which may be *G. Nordmanni*, Fischer, (*G. pratincola*, Pall.), especially as Eichwald puts Pallas's name with a query after *G. torquata*.

FAMILY SCOLOPACIDÆ.

277. * Scolopax rusticola, L.

Múrgh-i-sirak (the cunning bird), Persian.

Common in the large gardens, many of which are extensive irrigated orchards and timber plantations, but only in the winter months. Woodcocks are said to abound in the forests near the Caspian at this season. I have not heard of any breeding in Persia.

[Rose gardens are the favourite haunt of the woodcock in Persia. In December, 1866, I shot five out of one small garden at Firúzabád. —O. St. J.]

278. * Gallinago major, (Gm.)

[The great snipe is not unfrequently shot in Northern Persia about the beginning and end of the season. I myself have once procured it. I have never seen it in the south.—O. St. J.]

279. G. scolopacinus, Bp.—De F.

Pashálek, Persian.

1 ♂. Jálk, Balúchistán .. .. .. 3000 .. March 17.

Common in winter in suitable localities. I saw three or four and shot a couple on the 2nd of May at Hanaka near Karmán, at about 8000 feet above the sea. The birds may have been in their breeding haunts, but it is just as possible that they were merely halting during migration, for some do not leave the tropical swamps of India before the beginning of May.

280. G. gallinula, (L.)

1 ♀. Dizák, Balúchistán	4000	March 24.
2 ♂. Near Isfahán	8000	April.

Generally distributed in suitable localities during the winter months.

281. * Limosa Lapponica, (L.)

Found on the Caspian (Eichwald, Pallas). I include all shore haunting waders and swimming birds, known to be met with on the Caspian, because there can be no doubt of their visiting the Persian coast in winter. The bar-tailed godwit has also been shot in Sind, (Hume, Stray Feathers, i, p. 235).

282. L. ægocephala, (L.)

1 ♀. Shiráz	4750	December.

I obtained this also at the mouth of the Euphrates, and it is of course found on the Caspian.

283. * Terekia cinerea, (Güld.)—De F.

Obtained at Enzeli on the Caspian by De Filippi, and on the Makrán coast by Hume.

284. Calidris arenaria, (L.)

1, 2 ♂, 3–7 ♀. Gwádar, Balúchistán	Sea shore	Dec., Jan.

The sanderling, very rare in India, was the commonest small wader on the Makrán coast. Hume, too, found it abundant at Karáchí. It also occurs on the Caspian.

285. Tringa cinclus, L.—De F.

1–4 ♂. Gwádar, Balúchistán coast	—	Dec., Jan.
5, 6 ♀. Shiráz	4750	December.

Found common on the coasts of Balúchistán in winter. De Filippi found it also abundant at Enzeli on the Caspian in the beginning of September.

286. * T. minuta, Leisl.—De F.

Hume obtained the little stint on the Makrán coast, and De Filippi at Enzeli on the Caspian. It is rather curious that neither St. John nor I happened to shoot it, but I saw some small *Tringa*-like waders at Shiráz lake in June, which looked very much like it.

287. * T. subarquata, Güld.

Hume records this also from the Makrán coast. Pallas says it is found on the Caspian in spring.

288. T. platyrhyncha, Tem.

1 ♀. Pasní, Makrán coast .. .. .. November 22.

Obtained also by Hume in Balúchistán. *T. crassirostris*, Tem. and Schl. was procured by the same naturalist in Karáchí, but has not been observed further west.

289. * T. pugnax, L.

Found on the Caspian, according to Eichwald.

I can find no record of the occurrence of *T. Temmincki*, Leisler, in Persia, not even on the Caspian; but it must occur, and is probably by no means rare.

290. * Phalaropus fulicarius, (L.)

Mr. Hume (Stray Feathers, i, p. 245) mentions that he met with this bird abundantly on the Makrán coast in February. I had previously heard of some small light-coloured birds which were to be seen swimming in the sea at a considerable distance from land, but when I passed along the coast in November and December there were very few, and I only saw one flock, and that at a distance. They are, when on the sea, wary and difficult to shoot, and Mr. Hume only succeeded in obtaining one specimen. It is by no means improbable that both this and the next species occur on the coast.

291. P. hyperboreus, (L.)

1, 2, 3 ♂, 4 ♀. Near Tehrán .. .. 5000 .. March 28.

The specimens are all in the grey winter plumage, but a few ferruginous feathers are commencing to show at the sides of the neck and on the interscapulary region. There appears to be no difference in size between the sexes, and the measurements are: wing 4.35 to 4.45, tail 1.75 to 1.95, tarsus 0.75 to 0.85, culmen 1 to 1.05.

I learn from Major St. John that the red-necked phalarope is by no means a rare bird in Persia in the winter months, usually keeping in small flocks, and haunting pools of water. It is probably much more common than *P. fulicarius*, for it is mentioned as found on the Caspian by Pallas, Ménétries, and Eichwald, whilst the grey phalarope is not.

[I shot four phalaropes on a pool near Yazdikhást, between Shiráz and Isfahán, in May. I have never seen the bird farther south.—O. St. J.]

292. Totanus calidris, (L.)—De F.

1, 2 ♂.	Shiráz lake	4700 ..	June 8.

Occasionally seen in Balúchistán in winter. The redshank probably breeds on the Persian highlands at the Lake of Shiráz and other places. De Filippi met with it, in July, near Sultániah.

293. T. stagnatilis, Bechst.

1 ♀.	Bampúr, Balúchistán	1800 ..	April 6.

The only specimen shot; it is in breeding plumage.

294. * T. fuscus, (L.)

Caspian (Pallas). I did not obtain either this or *T. glottis*, but both doubtless occur in Persia.

295. T. ochropus (L.)—De F.

1 ♂, 2 ♀.	Kalagán, Balúchistán	3500 ..	March 12.
3.	Shiráz	4750 ..	December.
4, 5 ♂.	Near Shiráz	6000 ..	(?)

296. T. glareola, (L.)—De F.

1 ♂.	Rígán, Narmashír	2500 ..	April 17.
2 ♀.	Near Bam, south-east Persia ..	3000 ..	April 20.

297. Tringoides hypoleucus, (L.)

1 ♂.	Bampúr, Balúchistán	1800 ..	April 7.
2 ♂.	Shiráz	4750 ..	December.
3 ♀.	Lura valley, Elburz mountains ..	7000 ..	August 10.

These three species were met with here and there along streams in

Balúchistán during the winter months. *T. ochropus* appears the most abundant, and is the only one mentioned as found on the Caspian by Ménétriès and Eichwald.

298. Himantopus candidus, Bon.

1 ♀. Near Bam, Narmáshír, south-eastern Persia	3000 ..	April 30.
2 ♂, 3 ♀. Near Tehrán	5000 ..	March.

Frequently seen in Balúchistán in the winter months. It is also of course found on the Caspian.

I saw stilt plovers at Shiráz lake on June the 8th, so some probably breed there. Their breeding in India has been described by Mr. Hume, Ibis, 1870, p. 145.

299. Recurvirostra avocetta, (L.)

1 ♀. Shiráz lake	4700 ..	June 8.

I only saw the avocet at Shiráz lake, where there were several pairs apparently breeding.

300. * Numenius arquatus, (L.)

301. * N. phæopus, (L.)

Both these curlews are said to occur on the Caspian by Eichwald. *N. arquatus* was seen on the Makrán coast by Hume, and I believe I saw it myself there and in the Persian Gulf, and there can be no question but that the whimbrel will also be found.

Major St. John tells me that the common curlew is often seen in the plain of Shiráz.

FAMILY GRUIDÆ.

302. * Grus communis, Bechst.

Eichwald gives the common crane from the southern portion of the Caspian. It doubtless may be found in many parts of Persia during the migratory season, and it is probable that *G. virgo* and *G. leuco-*

geranus both visit parts of Persia at times, both being found in India, and also on the shores of the Caspian.

I saw flocks of cranes flying overhead on two or three occasions in Balúchistán, about March. They may have been either the common crane or the demoiselle.

[Cranes are very plentiful in Southern Persia, but very wary. I never succeeded in shooting one.—O. St. J.]

FAMILY OTIDÆ.

303. * **Otis tarda**, L.

Found, according to Eichwald, in the Caspian islands, near Astrabád. It has been obtained in the extreme north-west of India, and is probably an occasional visitant to many parts af Northern Persia.

Major St. John informs me that he believes it is found in Adarbaiján, he has himself seen it in Armenia, just beyond the Persian frontier, and it is common in the Transcaucasian provinces of Russia.

304. * **O. tetrax**, L.

Major St. John tells me that he has seen a specimen of the little bustard, which had been shot close to Tehrán. It is said to be very common in the country west of the Caspian, and must occur, I think, not seldom in Adarbaiján. It is sometimes obtained in North-western India.

I saw a small bustard on one of the islands of the Persian Gulf, which was probably this species. It is said also to be found in Mesopotamia.

305. * **O.** (*Houbara*) **McQueenii**, Gray.

Hobara, **Persian.**

Found throughout Persia, being the only common bustard of the country. It is a summer visitant to the plateau, where it breeds, passing the winter in the lowlands of Southern Persia, Balúchistán, and Sind.

De Filippi states that he obtained at Julfa, in Armenia, two specimens of *O. houbara*, and that they were not *O. McQueenii*, but he did not preserve them for comparison.

306. * Œdicnemus crepitans, Tem.—De F.

[illegible], Persian.

De Filippi saw the stone plover at Maiana and Sarchain, between Tabriz and Kazvin. It probably occurs in Southern Persia also.

[Not uncommon about Bushire. Never seen on the plateau.—O. St. J.]

FAMILY RALLIDÆ.

307. Rallus aquaticus, L.

Scolopax [illegible], S. G. Gmel. Reise, iii, p. 92.

1 ♂, 2, 3 young ♀. Near Shiráz .. .. 5000 .. August.

Probably not rare in the higher marshes, but I do not know if it breeds there. Judging from one of the specimens, which is scarcely full grown, I should think it did. The specimens were collected by Major St. John. Ménétries found it in the marshes between Salián and Lankorán.

[A water rail, migrating from Arabia, was caught between the sashes of the window at the Bushire Residency, in April.—O. St. J.]

308. Porzana maruetta, Leach.—De F.

1. Shiráz .. .. May.

De Filippi states that Doria found this rail common in spring at Veramin, south-east of Tehrán.

Probably *P. pymæa*, Naum. and *P. minuta*, Pall. may also be found in Persia. The latter occurs near the Caspian, and Hume found it abundant in Sind. The former also inhabits both Europe and India.

309. Crex pratensis, Bechst.

One specimen, without a label, is amongst the specimens collected by Major St. John, who thinks he obtained it at Tehrán.

310. Gallinula chloropus, (L).—De F.

1. Síb, near Dizák .. .. .. 4000 .. March 26.

Doubtless to be met with throughout Persia in suitable localities. It is common in the Caspian provinces.

[Not uncommon about the rivers and marshes of Southern Persia.—O. St. J.]

311. * Porphyrio veterum, S. G. Gm.

Reise, iii, p. 79, Pl. XII.

Found abundantly, according to S. G. Gmelin, on the Caspian in Ghílán. Specimens from this locality require comparison with the European *P. hyacinthinus*, Temm.

312. * P. neglectus, Schl.

A specimen collected by Loftus is referred to this race by Mr. Gray (Handlist, iii, p. 64), and the locality is there stated to be Persia. The locality in the British Museum register is, however, Bághdád. It is probable that the bird, which appears to be correctly referred to the Indian race, is from Turkish territory, but it must in all probability inhabit Persian Mesopotamia also.

313. Fulica atra, L.—De F.

1 ♂. Bampúr, Balúchistán .. .. 1800 .. April 2.

I did not meet with many likely spots for coots in Balúchistán, and none were noticed on the highlands in summer. They are common on the Caspian according to De Filippi and Ménétries.

GAVIÆ.

The whole of my specimens of gulls and terns have been examined by Mr. Howard Saunders, and compared with his fine collection.

I have included all the Caspian terns and gulls in the Persian fauna, since all occur at times, to the best of my knowledge, on the Persian coast of the Caspian.

FAMILY LARIDÆ.

314. * Stercorarius parasiticus ? (L.)

S. Asiaticus, Hume, Stray Feathers, i, p. 268.

A skua is not rare on the Makrán coast, and I think it also occurs in the Persian Gulf. I obtained no specimen, and Hume only secured one, which he identified, with some doubt, as *S. parasiticus*, but proposed to call it *S. Asiaticus*, should it prove new.

Mr. Saunders suggests the possibility of the Makrán bird proving identical with the Cape species *S. spinicauda*, Hardy.

315. Larus fuscus, L.—De F.

? *L. occidentalis*, Hume, Stray Feathers, i, p. 273, nec Aud.
1 ♂, 2, 3, 4 ♀. Gwádar, Balúchistán .. .. January 1-12.

Three of the above are in the young plumage and may belong either to this or the next species. The fourth is a young female assuming the summer plumage, and both Mr. Howard Saunders and Mr. Dresser, who have very carefully and repeatedly examined it, have no doubt of its really belonging to *L. fuscus*. Mr. Hume referred this bird, from the same locality, to *L. occidentalis*, because the basal portion of the primaries is grey or greyish; but Mr. Howard Saunders informs me that this is not a safe character, except, if I understand him rightly, in full summer plumage. It follows that Dr. Jerdon and Mr. Blyth were probably right in including this species in the Indian fauna.

The young female assuming the summer plumage has been fully described by Mr. Dresser in the 'Birds of Europe.'

L. fuscus is also common on the Caspian.

316. L. argentatus, Gmel.—De F.

Hume, Stray Feathers, i, p. 270.
L. leucophæus, Licht, Dresser, Birds of Europe.
? *L. cachinans*, Pall. partim.

1 young ♂. Omára, coast of Balúchistán .. .. Nov. 28.
2 young ♀. Pasní, coast of Balúchistán .. .. Nov. 29.
3, 4 ♂, 5 ♀, 6, 7, 8 young. Gwádar, coast of Balúchistán .. .. Dec., Jan.
9 young ♂. Bushire, Persian Gulf .. .. January.

These specimens have been referred by Mr. Dresser to *L. leucophæus*, which Mr. Howard Saunders tells me he considers only a climatic variety of *L. argentatus*. They are intermediate in character between the two European forms, which are distinguished by the latter having the mantle a shade darker, and the legs in the adult yellow instead of flesh coloured. In my adult specimens the legs were flesh coloured with a yellow tinge. Hume gives them as pale yellow, greenish yellow and pale lemon yellow with a grey shade, and those of the immature birds in winter plumage as greyish white, with more or less of a fleshy tinge. This agrees with my own notes. If the two races are kept separate, the Balúchistán bird will have to be referred to *L. leucophæus*, or perhaps they should rather be called *L. cacchinans* Pall. which name has priority, but appears, according to Dresser, to comprise both the pale race and the dark coloured form known to some authors as *L. occidentalis*.

The young of this species are absolutely undistinguishable by any certain character from the last; usually they may be known by the shafts of the primaries being pale towards the base, but no line can be drawn.

L. argentatus (v. *leucophæus*) was, I think, on the whole, in November and December, the commonest gull on the Makrán coast and the Persian Gulf, with the exception of *L. Hemprichi*. It is much more frequently to be found a short distance inland than the latter, keeping more about backwaters and creeks. Thus at Gwádar, *L. argentatus* and *L. fuscus* swarmed about a pool of rain water near the village, and even acted as scavengers in the village itself, picking up offal and pieces of fish, whilst *L. Hemprichi*, although abounding on the sea close to the coast, was not actually seen on the shore.

L. argentatus (*L. cacchinnans*, Pall.) is also common on the Caspian.

317. L. canus, L.

L. niveus, Pall.

1. Bushire, Persian Gulf .. .. January.

Neither Mr. Hume nor I obtained this species on the Balúchistán coast; and the specimen from Bushire was one of those collected by Major St. John. It considerably extends the known range of the common gull. The specimen belongs to the larger race *L. niveus*, Pall., *L. Heini*, von Hom. Wing 14.5, tail 5.6, tarsus 2.15, culmen 1.9, none of which exceed some measurements of British skins.

Larus canus is said by Ménétries to be the commonest bird on the Caspian. Eichwald states that it breeds in large numbers on the Kulali and other islands on that sea, together with several species of tern.

318. L. gelastes, Licht.

L. Lambruschini, Bp. Hume, Stray Feathers, i, p. 274.

1 ♂. Rás Malán, Balúchistán coast .. .. Nov. 26.
2 ♀. Pasní, Balúchistán coast .. .. .. Nov. 29.
3 ♂. Gwádar, Balúchistán coast .. .. .. Jan. 8.

Very common on the Makrán coast and in the Persian Gulf. Hume says more so than any other species at Karáchí, but I think along the coast in November and December (six weeks earlier in the year than Mr. Hume's visit, which may have made a considerable difference) both *L. argentatus* and *L. Hemprichi* were more numerous everywhere, except at Jáshk, where I saw more of the present species. At Gwádar I did not observe *L. gelastes* at all.

319. L. ridibundus, L.—De F.

1 ♀. Maskat, Arabia	.. ..	Dec. 11.

This does not appear to be common on the coast of Balúchistán; at least I obtained but this one specimen. Mr. Hume, however, shot more. It occurs, as might be expected, on the Caspian.

320. L. Hemprichi, Bp.

Finsch, Tr. Z. S. vii, p. 302, Pl. XXVII.—Hume, Stray Feathers, i, p. 279.

1, 2 ♂. Gwádar, Balúchistán coast	.. ..	Dec., Jan.
3-8 ♀. Off Maskat, Arabian coast	.. ..	Dec. 5.

Extremely common all along the coast of Balúchistán and Southern Persia, more so, I think, than any other species. On several occasions in the Gulf of Omán I saw large flocks out at sea, several miles from the coast, and on one occasion Captain Bishop lowered a boat for me, and I shot about a dozen, seven or eight falling to the first two barrels, although there was a considerable swell, which prevented anything like a great slaughter. All the specimens thus shot proved to be females. These birds are, as was noticed by Hume, very tame, coming close to the fishermen's boats at Gwádar and feeding on the offal of fish; but, although they will come when the men call them and make a show of casting out food for them, they do not, so far as I saw, enter the village on shore like *L. argentatus*. They doubtless breed in the Persian Gulf.

I almost expected to find with *L. Hemprichi* its associate in the Red Sea, *L. leucophthalmus*. The two closely resemble each other in winter plumage, but neither Mr. Hume nor I obtained the latter.

321. * L. ichthyaëtus, Pall.

Hume, Stray Feathers, i, p. 276.

I saw this large gull (at least, I have no doubt it was this species) constantly at Gwádar, and I spent much time in trying to shoot specimens, but I could never get sufficiently near. It is curious and illustrative of the varying habits of gulls, that whilst Tristram found the great black headed gull quite tame in Palestine (Ibis, 1868, p. 330), and Hume says nothing of its being particularly wild, I spent two or three afternoons fruitlessly after it in Gwádar Bay, and Ménétries notices how difficult it is of approach upon the Caspian. It is found throughout the southern coasts of Persia in winter and resorts to the Caspian, where it breeds, in summer.

322. * L. marinus, L.

The greater black backed gull is stated by Pallas and Eichwald to be found in the Caspian. Both also give *L. nævius*, which is the same species.

L. glaucus, Brunn, is another species included in Eichwald's list. Probably the gull meant is *L. glaucus*, Retz. (nec Brünnich), which is *L. argentatus*.

323. * L. minutus, Pall.

Said also to occur on the Caspian.

324. * Rissa tridactyla, (L.)

Found on the Caspian by Ménétries and Eichwald, but not common.

325. * Sterna fluviatilis, Naum.—De F.

S. hirundo, (L.), De F. Viag. in Persia, p. 352, nec Linn.

De Filippi, Ménétries, and Eichwald all mention this tern under the name of *S. hirundo* as common on the Caspian. For the differences between the arctic tern, the true *S. hirundo* of Linnæus, and the present species, see Sharpe and Dresser in the 'Birds of Europe.'

It is by no means improbable that *S. hirundo* also may visit the Caspian in winter.

326. S. Caspia, Pall.—De F.

1 ♀. Gwádar, Balúchistán coast .. .. .. December.

Not common on the Balúchistán coast, although both Hume and I obtained specimens. It is more abundant on the Caspian, where it breeds, according to Eichwald. Ménétries says it is very common at Lankorán in June.

[Very common on the Shiráz and Kázrún plains in winter.—O. St. J.]

327. S. cantiaca, Gm.

1, 2 ♀. Gwádar, Balúchistán coast .. .. December.

Common on the Makrán coast.

328. * S. affinis, Rüpp.

S. Bengalensis, Less., Hume, Stray Feathers, i, p. 284.

Equally common with the last according to Hume.

329. * S. Bergii, Licht.

Rare on the Makrán coast. For notes on these three species see Hume, 'Stray Feathers,' i, pp. 283–286. All are found out at sea.

330. * S. minuta, L.—De F.

Caspian. De Filippi obtained it at Enzeli, and also on the Persian plateau at Miána. Eichwald also mentions it amongst the terns common on the Caspian.

331. * S. fissipes, L.—De F.

Caspian. De Filippi states that it is excessively abundant at Enzeli. I presume too that this is the *S. nævia* which Pallas and Eichwald say is common on the Caspian.

332. * S. nigra, L.—De F.

S. leucoptera, Tem., De F. Viag. in Pers. p. 352.

Caspian (Mén., Eichw., De F.)

333. * S. hybrida, Pall.—De F.

Caspian (De F.)

S. Indica, *S. Anglica*, and perhaps *S. Javanica*, will probably be found to inhabit Persia besides the species enumerated, whilst *Anous stolidus* and *Onychoprion anasthætus* probably inhabit parts of the Persian Gulf and adjoining seas, and *Rhyncops albicollis* is very likely to be found on the Euphrates.

FAMILY PROCELLARIDÆ.

334. * Puffinus obscurus, Gm.

P. Persicus, Hume, Stray Feathers, i, p. 5.

Mr. Hume frequently saw a shearwater on the Makrán coast, and once obtained a specimen which he considered new. The same species is said also to be common in the Persian Gulf. I have shown (Ibis, 1873, p. 215) that it is probably a variety of *P. obscurus*.

HERODIONES.

FAMILY ARDEIDÆ.

335. * Ardea cinerea, L.—De F.

336. A. purpurea, L.

1 ♀. Isfahán 5000

Both found in suitable localities throughout Persia.

Both Major St. John and I noticed at Bampúr, on the river, a very large dusky heron, which was certainly neither of the common species, and may have been *A. Goliath*.

337. A. alba, L.—De F.

1 ♂. Bampúr, Balúchistán .. .. 1800 .. April.

Not common, but occasionally seen both in Balúchistán and on the highlands. It is also found on the Caspian.

The specimen obtained is rather large, measuring when fresh: length 43 inches, wing 18, tarsus 8, bill from end of feathers on forehead 5.

[There is a colony of great white herons on the **Kárá-agatch** river, west of Shiráz. I have seen them every summer for years.—O. St. J.]

338. A. garzetta, L.—De F.

1 ♀. Isfahán .. .. 5000 .. April 6.

Same distribution as the last. I saw many at Isfahán.

339. * A. ibis, Hasselq.—De F.

Buphus bubulcus, (L.). De F. Viaggio in Persia, p. 351.

De Filippi states that all the three last species were found in countless numbers on the Murdáb, an inlet of the Caspian, close to Enzeli.

340. * A. gularis, Bosc.

Very abundant on the rocks at Gwádar. I did not notice it elsewhere, but Mr. Hume found it equally common at Karáchí and Maskat. All I saw were in the slaty plumage.

A. comata, Pall. is probably Persian also, but I have no evidence of its occurrence within our area. It is said by Pallas to inhabit the neighbourhood of the Caspian.

341. * Nycticorax griseus, (L.)

I saw the night heron at Isfahán. Major St. John has shot it near Shiráz, and Ménétries met with it at Lankorán. It is probably very locally distributed.

[In the winter of 1866–7, being at Firúzabád, eighty miles south of Shiráz, I found a colony of night herons inhabiting a great cypress tree in a garden there. Not knowing what they were, I shot one, which I had no difficulty in identifying from Yarrell's plate and description.—O. St. J.]

342. Ardetta minuta, (L.)

1, 2 ♀. Bampúr, Balúchistán .. .. 1800 .. April 6.
3 ♂. Mashīsh, south-west of Karmán .. 6000 .. May 21.

I found the little bittern common in two or three places in

Southern Persia and Balúchistán amongst thick bushes and reeds beside streams. Major St. John told me he had once before met with it in Southern Persia after an unusually severe winter (as that of 1872 was). Eichwald mentions its occurrence on the Caspian.

343. * **Botaurus stellaris**, (L.)

I did not meet with the common bittern in Persia, but Major St. John tells me he has occasionally seen it.

[I have twice shot a bittern. The first was an immature bird in the marshes of Shiráz, and the second in full plumage near Tehrán. —O. St. J.]

FAMILY CICONIIDÆ.

344. * **Ciconia alba**, Bechst.—De F.

Lag-lag, or *Hájjí Lag-lag*, Persian.

The stork is not rare in Northern Persia. It breeds in the towns, and I saw several at Kúm, south of Tehrán, sitting on their nests, which were at the summit of some of the high minarets so common in Mohammadan graveyards. Mr. Dresser, in the 'Birds of Europe,' states, on my authority, that the stork is found in Balúchistán, but I think he has misunderstood me, as I do not remember seeing it there, though it may very possibly occur.

[The common stork is found all over the plateau of Persia, building its nests on minarets, and oftener on the low towers which flank the mud walls of Persian villages. It is not molested by Persians, who say that it makes a pilgrimage to Mecca during its annual winter absence, whence its name of *Hájjí*.—O. St. J.]

345. * **C. nigra**, (L.)—De F.

Less common, but I believe I once saw some at a distance in Southern Persia. Major St. John has occasionally noticed it, and Ménétries found it common at Lankorán.

[I have twice noticed this bird; on both occasions near Tehrán. —O. St. J.]

346. * **Tantalus ibis**, L.

Caspian (Pallas, Eichwald.)

FAMILY PLATALEIDÆ.

347. * **Platalea leucorodia**, L.

I once saw spoonbills at Bampúr, in Balúchistán. They are, of course, also found on the shores of the Caspian.

Although I leave the spoonbills and ibises in the *Herodiones*, I am far from certain that, despite the characters of the young, their true affinities are not with the cranes (conf. Garrod, P. Z. S. 1873, p. 36).

348. * **Ibis falcinellus**, (L.)—De F.

De Filippi found the glossy ibis in large numbers on the Murdáb, near the Caspian.

STEGANOPODES.

FAMILY PHALACROCORACIDÆ.

349. **Phalacrocorax carbo**, (L.)—De F.

1 ♂.	Gwádar, Balúchistán	Jan. 3.
2 ♀.	Maskat, Arabia	Dec. 3.

Excessively abundant on the Makrán coast. Every evening long processions of cormorants, flying at a considerable elevation, used to pass from one to the other of the bays on each side of the isthmus on which the village is built. I heard that all disappeared, with most of the gulls, pelicans, etc. about March. Cormorants are very abundant too on the Caspian.

[Cormorants abound on the lakes and rivers of Southern Persia.—O. St. J.]

350. * **P. graculus**, (L.)

Caspian (Pall.)

351. * **P. pygmæus**, Pall.—De F.

Caspian (Pall., Eichw.) Eichwald also gives *P. mærius*, Pall., which

I am unable to identify. *P. mævius*, Gmel. is *P. punctatus*, a New Zealand species.

Family SULIDÆ.

352. * **Sula fiber**, (L.)

I saw one or two boobies in the Gulf of Omán, probably of this species. Hume does not appear to have noticed any. They are said to be as common in parts of the Persian Gulf as they are in the Red Sea.

Family PHAETHONTIDÆ.

353. * **Phaëthon æthereus**, L.

Obtained by Hume, Stray Feathers, i, p. 286, on the Balúchistán coast. I did not see it there, though it is common further out at sea, and is usually seen between Aden and Bombay. Hume obtained specimens by firing a shot, when these birds, with their usual curiosity, came near to see what was the matter.

Family PELECANIDÆ.

354. * **Pelecanus onocrotalus**, L.—De F.

Common on the Caspian.

355. **P. crispus**, Feld.—De F.

1 ♀. Gwádar, Balúchistán coast .. .. Jan. 12.

Abundant on the coast of Balúchistán, keeping to the bays and inlets. The specimen obtained, for which I am indebted to one of the officers belonging to the telegraph, is a fine female. This species is found also on the Caspian, and De Filippi gives it, doubtfully, from Lake Gokscha.

I saw a few pelicans, at a distance, on the Lakes of Niríz and Shiráz, but of course could not determine the species.

Eichwald includes *P. cristatus* (= *P. rufescens*) as well as *P. onocrotalus* amongst the Caspian birds, but as he does not mention *P. crispus*, he has probably mistaken the one for the other. *P. rufescens* may, however, very probably occur in the Persian Gulf.

ANSERES.

Family PHŒNICOPTERIDÆ.

356. * Phœnicopterus antiquorum, Tem.

Káj-i-súrkh (Red-goose), Persian.

Common on the Balúchistán coast and in the Persian Gulf. In the latter, on one occasion, off the Island of Hormuz, I saw a flock swimming in the sea, at least half-a-mile from shore. Flamingoes are also said to be common on the Caspian. Major St. John tells me he has seen a flock on the Shiráz plain in May.

P. minor, an African species, which has been several times observed in India (compare Hume, Stray Feathers, i, p. 31), doubtless visits parts of Persia.

Family ANATIDÆ.

357. Anas boschas, L.

Múrghábí, Persian.

1 ♀. Tehrán .. .. 4000 .. (?)

Found throughout Persia in the winter months.

[Common everywhere; breeds occasionally about Shiráz. The name Múrghábí, like that of Urdak applied to the teal, is generic, and used for any waterfowl.—O. St. J.]

358. A. strepera, L.

A. Kekuschka, S. G. Gmel. Reise, iii, p. 249, Pl. XXVII.

1, 2 ♂, 3 ♀. Tehrán 4000

Same distribution as the last. S. G. Gmelin described his *A. Kekuschka* from Ghílán.

[One of the earliest birds to visit Persia. I have shot it near Shiráz in the first week of October.—O. St. J.]

359. Anas angustirostris, Mén.

A. marmorata, Temm.

1 ♀. Bampúr, Balúchistán .. .. 2000 .. April 6.

The only specimen of a duck secured in Balúchistán belonged to this species. It has also been obtained in Sind by Mr. Hume. It was originally described by Ménétries from specimens procured at Lankorán, on the Caspian.

360. * Querquedula crecca, (L.)

Urdak, Persian.

[The common teal is found all over Persia in winter.—O. St. J.]

361. * Q. circia, (L.)

Both species of teal are found on the Caspian, and doubtless to be seen in suitable localities throughout Persia.

362. Dafila acuta, (L.)

1. Tehrán 4000

Said to be found in Persia and on the Caspian.

[Very common in winter. More terrestrial in its habits than other ducks. Major Champain and I once shot over a dozen in less than an hour, in the fields bordering the Kázrún lake.—O. St. J.]

363. * Mareca Penelope, (L.)

Only noticed, as yet, on the Caspian, by Eichwald, and by Major St. John on the salt-water creeks about Bushire.

364. * Spatula clypeata, (L.)

I saw a shoveller at Bampúr; it is probably not rare. Like the others, it is included in the Caspian lists by Ménétries and Eichwald.

365. * Fuligula rufina, (Pall.)

Pallas states that he received this pochard from the neighbourhood of Isfahán.

[Breeds in the marshes about Shiráz; ducklings are often brought into the city and kept in the tanks, which occupy the middle of every courtyard in a Persian house.—O. St. J.]

366. * F. cristata, (Ray.)

367. * F. marila, (L.)

368. F. ferina, (L.)

1 ♂. Near Isfahán	7500 ..	April 7.

All the above pochards are found on the Caspian and doubtless locally throughout Persia. *F. ferina* I shot at Basrah.

369. F. nyroca, (Güld.)

1. Near Isfahán	7500 ..	March.

This also is included in the Caspian lists.

370. * Clangula glaucion, (L.)

Caspian.

371. ? * C. hyemalis, (Pall.)

Anas hyemalis, Pall. Zool. Ros. As. ii, p. 270.

This is separated from the last by Pallas, Ménétries, and Eichwald. For want of specimens I cannot ascertain if it be really distinct. It is said to be found on the Caspian, but to be rare. Pallas, on the authority of S. G. Gmelin, says that it is met with at all seasons of the year on the Persian mountains near the Caspian.

Pallas's description runs, '*Anas fusca, subtus albida, rostro brevi, speculo alarum diviso iridibusque albis, pedibus lutescentibus.*' It is said to be the size of a teal.

372. * Œdemia nigra, (L.)

Caspian (Pallas, Eichwald).

373. * Œ. fusca, (L.)—De F.

Found by De Filippi abundant on a pool of water near Tabriz and on Lake Gokscha. Pallas says it is found on the Caspian with the preceding, which is less common.

374. **Mergus albellus**, L.

1 ♂. Tehrán	.. ..	4000

The smew is not included by either Ménétries or Eichwald amongst the Caspian species.

375. **Tadorna vulpanser**, Flem.

1, 2. Tehrán	.. ..	4000

Found also on the Caspian (Pallas, Eichwald).

376. * **Casarca rutila**, Pall.—De F.

I saw the ruddy sheldrake on more than one occasion in Southern Persia, near Bam, and again on Shiráz lake. It also inhabits the Caspian, and De Filippi saw it in North-western Persia.

[The Brahmani duck of India is very numerous in Southern Persia, where it breeds.—O. St. J.]

377. * **Anser albifrons**, Gm.

Káj, Persian (generic).

Caspian (Mén.)

378. * **A. erythropus**, L.

Caspian (Eichw., Pallas).

379. * **A. ruficollis.**

Caspian (Pall., Eich., Mén.)

[One goose at least is very common in Persia. Many couples remain to breed in the reeds round the little lake of Dashtiarjan and the marshes near Shiráz, whence goslings are often brought into the town. I have never seen them in mature plumage, nor been able to shoot an old bird, so cannot say to what species they belong.—O. St. J.]

Singularly enough, *A. cinereus*, so abundant in North-western India, does not appear to have been noticed in Persia or on the Caspian; but the list both of geese and ducks is poor and might doubtless be largely increased.

380. Cygnus ferus, Leach.

1. Tehrán 4000

A young specimen, but I believe it belongs to this species. Swans, as Pallas has already noted, abound on the Caspian in winter, and I am told that on the Múrdáb, the great backwater between Resht and Enzeli, thousands are sometimes to be seen. In the depths of winter, when the northern part of the Caspian, near the mouth of the Volga, is frozen, all the birds fly south; and in the inlets near Enzeli, where frosts are unknown, all the swimmers and waders collect, it is said, in immense quantities, promising grand sport and many interesting captures to anyone who will pass January and February at Resht or Enzeli. These places are easily accessible and fairly civilized.

C. olor probably also inhabits the Caspian.

PYGOPODES.

FAMILY COLYMBIDÆ.

381. * Podiceps cristatus, (L.)

Common everywhere on the Balúchistán coast. I shot one or two, but did not preserve them. Hume gives a most exciting account of a grebe hunt, (Stray Feathers, i, p. 142). I saw a pair on the river at Bampúr in April. It is found also on the Caspian (Mén., Eichw.)

382. * P. nigricollis. Sund.

Hume obtained this also on the Balúchistán coast.

383. * P. auritus, (L.)

P. Caspicus, Gm., Mén. Cat. Rais. p. 54.

Common on the Caspian. Ménétries declares that *P. Caspicus* is different from *P. auritus*, but all other authors unite them.

[Very common in winter on the Kázrún lake. I shot several one year from an Indiarubber boat.—O. St. J.]

384. * P. minor, (Gm.)

1 ♂. Near Gwádar, Balúchistán .. .. .. Jan. 25.

Shot in a small pool of water in a stream. This also inhabits the Caspian, and I saw it occasionally on the Persian highlands.

REPTILIA.

THE orders of Reptilia represented in Persia are the *Chelonia*, *Lacertilia*, and *Ophidia*. No crocodiles are known to occur in the country; so far as I can learn, there are none in the Tigris or Euphrates, and I have been unable to obtain any information of their existence in Persian Balúchistán. In the neighbourhood of Sind *Crocodilus palustris* is common, I found it abundant in deep pools on the Hab river west of Karáchí, and heard of crocodiles (doubtless the same species) somewhat farther west; but there are few spots in Balúchistán where the supply of water throughout the year furnishes a suitable habitat for crocodiles, and the only locality where their existence is at all probable is in some of the great marshes on the shores of the Persian Gulf, especially that lying along the coast north of Kishm Island and west of Bandar Abbás. The absence of crocodiles in the Shat-el-Arab renders their existence in other rivers running into the Persian Gulf very improbable. It is rather surprising, however, that none are found there, since they are said to occur, though rarely, in Palestine, and they certainly extend much farther to the northward in India than the latitude of Basrah.

The most abundant reptiles in Persia by far are the lizards, several kinds of which swarm throughout the country. On the semi-desert plains *Eremias*, *Phrynocephalus*, and *Agama* are the prevailing forms, *Acanthodactylus* being only met with in the South, whilst a huge Uromasticid (*Centrotrachelus*) lives in burrows at the edge of the Sístán and Karmán desert, a second is found on the shores of the Persian Gulf, and a true *Uromastix* inhabits Mesopotamia. In hilly parts of the country *Stellio* and *Ophiops* prevail, the former keeping much to rocks, but one species being also found on old walls. The Geckos and Scincids are less numerously represented than the Agamoids and Lacertians, but still are not rare. Of snakes the prevailing forms are species of *Psammophis* and *Zamenis*, and, in Northern Persia especially, *Tropidonotus hydrus*. Poisonous snakes are less abundant, the only common one being *Echis carinatus*. All which were obtained belong to the *Viperidæ*, but poisonous *Colubridæ* undoubtedly exist. Land tortoises are common, and a species of *Clemmys* abounds in suitable localities.

The present list adds considerably to the number of reptiles known to exist in Persia. The forms inhabiting the neighbourhood of the Caspian have mostly been collected and described by various Russian naturalists, Pallas, S. G. Gmelin, Ménétries, Eichwald, and Strauch, but the only collections previously made in the central and southern parts of the country appear to have been those of Olivier, Aucher-Eloy, Kotschy, Keyserling, De Filippi, and Doria[1].

CHELONIA.

FAMILY TESTUDINIDÆ.

1. Testudo Ibera, Pall.—De. F.

T. Ibera, Pall. Zoog. Ros. As. iii, p. 18, Pl. II, fig. 2, 3 (1831).—Eichwald, Faun. Casp. Cauc. p. 47, Pl. V, VI.—De F. Viag. in Persia, p. 352.
T. ecaudata, Pall. Zoog. Ros. As. iii, p. 19, Pl. III, figs. 1, 2.
T. Mauritanica, Dum. et Bibr. Erp. Gén. ii, p. 44 (1835).
T. pusilla[2], Shaw apud Strauch, Mem. Acad. Sci. St. Pet. 1865, viii, No. 13, p. 14, nec Linn.
T. Græca, partim, Gray, Cat. Shield Rept. p. 10.

1–6. Karmán 5000

Dr. Gray unites this species with *S. Græca*. It appears to me to differ in colour, in the shape of the plates, and in being less convex and more oblong. It is kept separate by the authors of the *Erpétologie Générale*, and by Strauch in his work on tortoises.

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[1] See Introduction, pp. 3–6.

[2] The *T. pusllia* of Linnæus was from the Cape of Good Hope, and amongst other characters the fore and hind legs were said to be naked and without scales, whilst the colouration differs widely from that of *T. Ibera*.

T. ecaudata, Pall., was described from a drawing made by S. G. Gmelin of a specimen obtained on the south shore of the Caspian. It was said to have five toes on all its feet, but the additional toe on each hind foot may very possibly be attributed to an error of the draughtsman.

The name *Ibera* applied to this species by Pallas is derived not from Spain, but from another country anciently also called Iberia, viz. Georgia.

I was at first disposed to consider the South Persian *Testudo* a distinct species from *T. Ibera*, from ordinary specimens of which it differs in the form of the sternal plates, the pectorals and præanals being very short along the median suture. In young specimens the median suture between the pectoral shields is about half the length of that between the gulars and postgulars, which are equal to each other; in adults the proportion is still less, about one quarter. The median abdominal suture is always about one-third the length of the sternum. The suture between the præanals is about one-third as long as that between the anals. The transverse suture between the postgulars and pectorals is much curved, that between the abdominals and præanals is also curved.

Another circumstance which induced me to suspect that the tortoise of Southern Persia differed from that of the North was pointed out to me by Major St. John. In the first-named region the common land tortoise inhabits barren hill-sides and semi-desert plains far from cultivation. In Northern Persia it is chiefly found in woods and gardens.

On comparing my specimens, however, at the Zoological Gardens with a large series of living *T. Ibera* (*v. Mauritanica*) from various parts of Southern Europe and Northern Africa, I found that there was no constant difference, some of the African specimens having the same form of sternal plates as those from Persia.

Tortoises are common throughout Persia. All my specimens are from Karmán, but I frequently saw and examined others near Shiráz and on the road from Shiráz to Isfahán, which appeared to differ in no respect from those collected. I saw none east of Karmán, and I did not meet with any in Northern Persia, though they are far from rare.

2. * **T.** (*Homopus*[1]) **Horsfieldi**, Gray.

Testudo Horsfieldii, Gray, Cat. Tort. Croc. etc. Brit. Mus. 1844, p. 7.—Cat. Shield Rept. p. 7, Pl. I.—Günther, Rept. Brit. Ind. p. 7.
Homopus Burnesii, Blyth, J. A. S. B. 1853, xxii, p. 642.
Testudinella Horsfieldii, Gray, P. Z. S. 1870, p. 658.—Supp. Cat. Shield Rept. Brit. Mus. p. 12.—Ann. and Mag. Nat. Hist. Ser. 4, ii, p. 143, Feb. 1873.

Dr. Gray has referred to this species two carapaces obtained by General Goldsmid's party near Duruh, north of Sístán, and presented to the British Museum, where I have examined them. Although the animal has not been preserved, and consequently the number of the claws on the fore-feet, the peculiar character of this type, cannot be determined, the form of the carapace agrees well with that of *T. Horsfieldi*, and Dr. Gray is probably right in referring these specimens to that species, the range of which is thus shown to extend into North-eastern Persia.

The Sind tortoise, *T. Leithi*, Günther, P. Z. S. 1869, p. 502 (subsequently considered by Dr. Günther to be probably identical with *T. marginata*), may perhaps be found in Balúchistán, but I did not meet with it.

FAMILY EMYDIDÆ.

3. **Emys orbicularis**, (L.)—De F.

Testudo orbicularis, L. Syst. Nat. 1766, i, p. 351, No. 5.—Gm. Syst. Nat. i, pt. 3, p. 1039.—Pall. Zoog. Ros. As. iii, p. 17.
T. Europæa, Schneider, Schildk. p. 323, (1783).
Cistudo Europæa, Dum. et Bibr. Erp. Gén. ii, p. 220.—Gray, Syn. Rept. p. 19.—De F. Viag. in Pers. pp. 80, 352, etc.
Lutremys Europæa, Gray, Cat. Shield Rept. p. 40.—Supp. Cat. Shield Rept. p. 22.
Emys lutaria, Strauch, Mem. Acad. Sci. St. Pet. 1865, viii, No. 13, p. 49, nec *Testudo lutaria*, L.

1–5. Enzeli, on the Caspian Sea.

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[1] I doubt whether the division of the genus *Testudo*, on account of the number of claws on the fore-feet, first proposed by Duméril and Bibron, is quite natural. The character appears to me scarcely of generic importance. But if the African species having four toes on the fore-feet be made into a distinct genus *Homopus*, I fail to perceive any object to be gained by creating an additional genus for the Afghan tortoise as proposed by Dr. Gray.

This species is not known to be found, in Persia, anywhere except on the shores of the Caspian. It abounds at Enzeli in the great sheet of shallow water called the Murdáb and the various streams and creeks running into it. According to De Filippi, it is usually to be met with in brackish waters, *Clemmys Caspia* inhabiting running streams of fresh water.

The Caspian variety of the common European *Emys* is a very beautiful tortoise: the carapace above is dark olive, finely and closely dotted over with yellow spots, which tend to form radiating lines on the vertebral and costal plates; the sternum is uniformly coloured yellow. The head and limbs are also dark olive, finely spotted and streaked with yellow. It grows to a considerable size; I saw specimens nearly a foot long.

I cannot understand why this species, which appears to be unmistakably the *Testudo orbicularis* of Linnæus, should be known to all European naturalists by Schneider's later name, which is in no way preferable. Dr. Gray, in his Catalogue of Shield Reptiles, quotes the Linnæan title as a synonym of that given seventeen years later by Schneider. The name *Emys lutaria* employed by Strauch is by him ascribed to Marsili, Danubius perlustr. iv, p. 91, tab. 32 and 33, a work which I have not succeeded in finding. The *Testudo lutaria* of Linnæus is evidently a distinct form; it is said to be from India, and to be carinate on the three hinder plates.

4. Clemmys Caspia, (S. G. Gmel.)—De F.

Testudo Caspica, S. G. Gmel. Reise d. Russland, iii, p. 59, Pl. X, XI.
T. Græca, Pall. Zoog. Ros. As. iii, p. 17.
Emys Caspia, Eichwald, Zool. Spec. Ross. Pol. iii. p. 196.—Dum. et Bibr. Erp. Gén. ii, p. 255, partim.—Gray, Cat. Shield Rept. p. 22, partim.—De F. Viag. in Persia, pp. 88, 108, 352, etc.
Clemmys Caspica, Eichw. Faun. Casp. Cauc. p. 45, Pl. III, IV.—Strauch, Mem. Acad. Sci. St. Pet. viii, No. 13, p. 73.
E. Grayi[1], Günther, P. Z. S. 1869, p. 504, Pl. XXXVIII.
Emmenia Grayi, Gray, Supp. Cat. Shield Rept. Brit. Mus. p. 38.

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[1] The locality of the type presented by Dr. Leith to the British Museum was Bussora, evidently the port of that name (more correctly written Basrah) on the Shat-el-Arab, the stream formed by the union of the Tigris and Euphrates. It is well to note this, because all the other specimens presented by Dr. Leith at the same time were from Western India.

1–11. Near Shiráz, partly from Tang-i-Kerim, seventy miles east of Shiráz, partly from the Bandámir valley, near Persepolis.
12. Safed Rúd, south of Resht, North Persia.
13. Murdáb, near Enzeli, on the Caspian Sea.

The various authors who have referred the common *Clemmys*[1] of Southern Europe to this species have evidently been unacquainted with the young of the Caspian and Mesopotamian form, which is well distinguished by its peculiar colouration, and a specimen of which, received in the British Museum from the neighbourhood of Basrah, was recognised as distinct by Dr. Günther, and named by him *E. Grayi.* This was subsequently made the type of Dr. Gray's genus *Emmenia;* but although the specific difference is unquestionable, I cannot think the Eastern form deserving of generic separation, for the two species are very closely allied. Indeed, in the adults, the only characters by which the forms can be certainly recognised are the colours of the under part of the shell, and especially of the marginal shields just below the lateral edge of the carapace. In every specimen of *C. Caspia* which I have examined, young or old, the portions of the fourth, fifth, sixth, and seventh marginal shields (counting from the front) which are bent over between the axillary and inguinal incisions to meet the shields of the sternum, are yellow, marked with two black spots on each shield. In the European and Levant form, the oldest name for which appears to be *E. leprosa*[2], Schweigger, this is never the case, the inferior portion of the shields in question being of a uniformly dusky brown, or else brown with irregular patches of yellow. The sternal shields themselves, too, in *C. Caspia*, are dusky brown in the young, with narrow yellow margins, and in older specimens the yellow covers a larger portion of the surface, there being usually a black patch in the middle of each plate, whilst in the young of *C. leprosa* the sternum appears to be as a rule uniformly coloured, and in older shells the distribution of the pale and dark colours is less regular than in *C. Caspia*, the transverse sutures being frequently the portions which remain darkest. So far too as I can judge from the very fair series of specimens in the British Museum, the nuchal plate in adults of *C. leprosa* is always longer than broad, in *C. Caspia* it is as broad as long, or the breadth slightly exceeds the length. The markings on the neck and limbs consist in both forms of longitudinal yellow lines; these seem to be rather coarser in *C. leprosa* than in *C. Caspia*.

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[1] As Strauch has pointed out, the type of the genus *Emys* of Wagler was *E. Europæa* (=*E. orbicularis*); and the forms referred by Duméril and Bibron, Gray and others, to *Emys* are those constituting Wagler's genus *Clemmys*. The genus *Emys* was first proposed by Duméril, who, however, included all the fresh-water tortoises (*Emydidæ* and *Trionicidæ*), and named no typical species. Wagler divided the genus into several, which have been adopted more or less by subsequent writers, and he first defined the genus as now admitted.

[2] Duméril and Bibron appear to have united with *C. Caspia* the form inhabiting South-eastern Europe and Asia Minor, and they distinguished this from the species found in Spain and Northern Africa, their *E. sigriz*. If this distinction holds good, the latter is probably the true *C. leprosa*, whilst the Levant form must take Gray's name *C. vulgaris*, published in 1831, Syn. Rept. p. 24, Pl. IV.

But it is in the young shell that the distinctions between the two forms are most marked. Duméril and Bibron describe the young (of the European tortoise evidently) as tricarinate, but this character appears not to be constant, at least specimens from the Levant in the British Museum do not show it, whilst a specimen in which the lateral keels are well developed may perhaps be somewhat distorted. It is possible that two forms are still confounded under *C. leprosa*, in one of which the young is tricarinate, in the other destitute of lateral keels, but this I have no means of determining. The central keel, however, does appear always to be more developed in *C. leprosa* than in *C. Caspia*. But the principal distinction of the Eastern species can only be seen when the epidermal shields are worn thin, or when they have been removed, and then upon the blackish surface of the bone-plates beneath there is seen a double whitish ring, somewhat like a distorted figure of 8, on each of the vertebral and costal shields, and a single ring on each of the marginals. Lines run out from some of the angles of the rings to the margins of the shield, so that on some there is almost a double figure of 8. On the lateral marginals below the angle of the carapace the two characteristic black spots are also found, on removing the epidermal shield, to be due to the colouration of the bone-plates below.

That this is really Gmelin's species is shown by the following facts. Gmelin's type, described in the 'Reise durch Rüssland,' was procured in a stream called the Pusahat, close to the town of Shamaki, west of Bákú, on the Caspian, and the same form was found, as stated by Gmelin himself, in Ghílán. The plates in Gmelin's work are coarsely executed, and Pl. X, representing the upper part of the shell, might have been taken as well from *Emys orbicularis* (*E. Europæa*) as from *C. Caspia*, but Pl. XI, in which the sternum is figured, is evidently, from the colouration, taken from the Caspian *Clemmys*, the peculiar black spots on the marginal plates being clearly shown. Plates III and

IV of Eichwald's Fauna Caspio-Caucasica also evidently represent the present form, although the colouration of the soft parts is incorrect, and the sternum is represented as uniformly dark, which is not the case in such specimens as I have examined; but the nuchal plate is nearly square, and the characteristic dark spots are shown on the lower portions of the marginal shields.

The two specimens obtained by me in Ghilán, near Resht and Enzeli, both quite young, agree exactly with those obtained in Southern Persia, and with the types of *E. Grayi* from the Euphrates. This *Clemmys* abounds in the streams running into the Caspian in Ghilán, in the creeks around Resht, and, according to De Filippi, in running waters throughout Georgia. It is equally common in the streams of Southern Persia, and probably in Mesopotamia, for it evidently abounds in the Shat-el-Arab at Basrah, whence a fine series has quite recently been procured for the Zoological Gardens in London. In the Bandámir valley I saw hundreds on the banks of the streams which traverse the plain of Persepolis. I did not meet with this species more than 100 miles east of Shiráz.

Major St. John informs me that he has seen a fresh-water tortoise, probably a *Clemmys*, in great numbers, on the banks of a small brackish stream near Kázrún, on the road between Bushire and Shiráz. They were larger than *C. Caspia* usually is near Shiráz, and they wanted the bright green and yellow colouring of the soft parts. This last difference may have been due to age, the colours being less distinct in older specimens, but it is possible that the Kázrún form may be distinct. Major St. John tells me that, on a subsequent occasion, a search for this tortoise at the salt lake near Kázrún was unsuccessful.

FAMILY TRIONYCIDÆ.

5. Trionyx Euphraticus, (Daudin).

Testudo Euphratica, Daud. Hist. Nat. Rept. ii, p. 305, (1802).
T. rafeht, Olivier, Voy. Emp. Othm. Eg. et Pers. iii, p. 454, Pl. XLI, (1807).
Trionyx Euphraticus, Gray, Synops. Rept. p. 48.
Gymnopus Euphraticus, Dum. et Bibr. Erp. Gén. ii, p. 498.
Trionyx rafeht, Gray, Cat. Shield Rept. p. 65, Pl. XXX.
Rafetus Euphraticus, Gray, Supp. Cat. Shield Rept. p. 104.
Trionyx rafeht, Strauch, Mem. Acad. Sci. St. Pet. 1865, viii, No. 13, p. 130.

This species, which inhabits the Tigris and Euphrates, must be found in the large streams running into those rivers from the eastward, the Karún for instance, and there cannot I think be much doubt of the propriety of including it in the Persian fauna. I do not know if it inhabits the Shat-el-Arab, the estuary formed by the united rivers, the left bank of which for some distance from the mouth belongs to Persia.

LACERTILIA.

FAMILY AGAMIDÆ.

6. Calotes versicolor, (Daudin).

Dum. et Bibr. Erp. Gén. iv, p. 405.—Günther, Rept. Brit. Ind. p. 140.

1.	Khor Askán, north of Bampusht, Balúchistán ..	3000
2-6.	Kalagán, Balúchistán	3500

I was somewhat surprised at finding this Indian tree-lizard in Balúchistán, for it extends far to the east of India, and even to China, and as a rule the animals (forms of world-wide distribution excepted) which range from the Malay countries into India are not found even in Western India. *Pratincola caprata*, however, affords one instance of a species ranging both east and west of India, and *Calotes versicolor* is another. The latter had previously been brought from Afghánistán.

I only met with this species twice, and on both occasions it was found on date-palms. As the plantations of these palms are few in number and many miles intervene between them, it is very difficult to account for the appearance of these lizards, unless we suppose them to have inhabited the country at a time when it was more covered with wood than is the case at present. It is quite true, as stated by Dr. Stoliczka, J. A. S. B. 1872, p. 110, that *Calotes* is often not much more arboreal than terrestrial in its habits. I have repeatedly seen and captured specimens on the ground, but always, I think, in the neighbourhood of trees. I do not remember meeting with it in open plains away from trees or large bushes, as I have often seen *Sitana Pondiceriana*, and I cannot conceive a *Calotes* crossing the desert plains and barren rocky hills of Sind and Balúchistán to reach patches of date cultivation. In the geological portion of this work, however, details are given to show the probability of a more moist climate having formerly existed in Persia and Balúchistán, and it is reasonable to suppose that this lizard migrated into the country whilst this was the case. Many of the date-groves are probably of very high antiquity, and the *Calotes* may have inhabited them for ages.

I cannot say how far this species extends to the westward in Balúchistán; it should be looked for in the country near Bushire and the date-groves of Mesopotamia.

7. **Agama agilis**, Olivier.—De F.

Olivier, Voy. Emp. Othm. Ég. et Pers. ii, p. 428, Pl. XXIX, fig. 1.—Dum. et Bibr. Erp. Gen. iv, p. 496.—De F. Viag. in Pers. p. 353.—Anderson, P. Z. S. 1872, p. 384.

1–8.	Samán, Dasht, west of Gwádar, Balúchistán	—
9–11.	Báhú Kalát, Baluchistán	—
12–16.	Mand, Balúchistán	700
17.	Ispidán, near Mand, Balúchistán	1000
18, 19.	Zamrán, Balúchistán	2000
20, 21.	Ghistigán, Bampusht, Balúchistán	3000
22–24.	Isfandak, Balúchistán	3000
25.	Dizak, Balúchistán	4000
26–29.	Sib, west of Dizak, Balúchistán	4000
30, 31.	Magas	4500
32.	Between Magas and Bampúr, Balúchistán	3000
33, 34.	Near Rígán, Narmashír, south-eastern Persia	2500
35.	Karmán	5000
36–42.	Southern Persia (labels illegible).	
43.	Ghílán, northern Persia	—

This is the most common and widely spread of the Agamoid lizards of Persia; indeed amongst all the Persian lizards I know of there is but one, *Eremias pardalis*, which has an equally extensive range throughout the country. *Agama agilis* is to be found equally on rocky hills and open plains, lurking in the clefts of the rocks or under roots of bushes. It is active in its movements, running with considerable speed. So far as I have seen, it never ascends trees or bushes, but is always to be found on the ground; its original discoverer however, Olivier, says that he observed it on shrubs near Baghdad. I cannot help suggesting that he may have confounded the habits of this species with those of the nearly allied *Trapelus ruderatus*.

I do not remember noticing *A. agilis* at any considerable elevation above the sea, even in Southern Persia, as a rule, I think, not above

6000 feet, and it was met with throughout Balúchistán as low as the sea level. It has been obtained in the Punjab in India by Theobald, and I myself collected specimens in Sind, near Karáchí.

The following notes of the colouration are taken from living specimens. Upper parts dark sandy, with a bluish tinge on the scales of the back; the limbs above with faintly-marked pale narrow cross bands; tail with transverse dark bands about a quarter of an inch apart, becoming more distinct and black about the tip. Sides of body dull cobalt blue speckled with sandy. Abdomen whitish, often with darker longitudinal bands more or less distinctly marked. Chin mottled bluish and sandy or dusky; throat pale blue; a black fold before each shoulder.

In spring the blue colouration becomes richer and darker, the chin, throat, and sides of the belly becoming dark ultramarine, more or less mottled with white. Some specimens have claret-coloured spots on the back, forming imperfect cross-bands. Young specimens are sometimes transversely banded with dark brown on the back, the cross-bands being more or less broken up by lighter patches.

8. **Trapelus ruderatus**, (Olivier).—De F.

Agama ruderata, Olivier, Voy. Emp. Othm. Eg. et Pers. ii, p. 429, Pl. XXIX, fig. 3.
A. mutabilis, Dum. et Bibr. Erp. Gén. iv, p. 505 partim, nec Merr. Syst. Amph. p. 50.
Trapelus ruderata, Gray, Cat. Liz. Brit. Mus. p. 258.
Agama Lessonæ, De F. Viag. in Persia, p. 353.
Trapelus ruderatus, Anderson, P. Z. S. 1872, p. 384.

1–8.	Near Shiráz	4000
9.	Near Isfahán	5000

I have examined the type of *Agama Lessonæ*, De F., in the Turin Museum. The whole of the dorsal scales, whether enlarged or not, are distinctly keeled, but I cannot consider this as a specific character, because I find that there is great variation amongst the specimens of *T. ruderatus* from one locality, some having all the scales or nearly all distinctly keeled, whilst in others only a few are carinate. Usually the keeled scales have a fresher appearance, whilst those which are not keeled have a worn rounded look, as if all the scales were normally keeled but the keels wear off.

It should be borne in mind that the Persian lizard is the type of *Agama ruderata* of Olivier, and therefore even if the Egyptian form be separated, Olivier's name must be retained for the Persian animal. Judging from the specimens from North-eastern Africa in the British Museum, I am disposed to consider that they are distinguished from the Persian lizards by the back being mostly covered with equal-sized scales in transverse rows with only a few distinctly keeled larger scales scattered singly here and there, whilst in the true *T. ruderatus* larger and smaller scales are most irregularly mixed, and the smaller scales are neither uniform in size, nor arranged in distinct rows. The Egyptian species, if it be, as I think it is, distinct, will retain the name of *T. mutabilis*, Merr.

On the whole, my specimens agree fairly with Dr. Anderson's description of those obtained by him from Shiráz, except that the tail is about 1½ times the length of the head and body, instead of a little less than twice the length, and that I think the number of oblique rows of ventral scales between the fore-legs, 14, must be a misprint for 24. It is, however, very difficult to specify any exact number, no two people in all probability would count the same in any given specimen. The largest specimen I possess measures 7.5 inches, of which the tail from the anus measures 4.1, fore-limb 1.7, hind-limb 2.25.

The colour when fresh was sandy, with transverse bands formed of large subquadrate spots on the back; these are usually red, but sometimes dusky, the animal having probably the power of changing the colour. Tail with irregular cross-bands often indistinct. There are five transverse bands between the head and the thighs, the anterior one being on the neck.

I only met with *Trapelus ruderatus* near Shiráz and Isfahán; Anderson received it from Tehrán. The type of *Agama Lessonæ* was from near Isfahán. I did not notice this species far east of Shiráz. It is very often found on bushes, indeed I saw it more commonly in this position than on the ground. The greater portion of the specimens captured were females, and they appear to have been engaged in laying eggs, which may possibly have been connected with their being found on bushes. In the oviducts of one I find as many as thirteen eggs about half-an-inch long.

9. **Stellio nuptus**, De F. Pl. XIX, fig. 1.

Agama nupta, De F. Giornale dell' I. R. Ist. Lomb. vi, 1843.
Stellio carinatus, A. Dum. Cat. Méth. Rept. Mus. Par. p. 107, 1851; Arch. Mus. Hist. Nat. viii, p. 580.
S. nuptus, De F. Viag. in Persia, p. 352.

1.	Near Sib, west of Dizak	4000
2–5.	South-east of Rígán, Narmashír, south-eastern Persia	3000
6–10.	Karmán	5000
11.	Tehrúd, near Karmán	5000
12.	South-east of Karmán	5500
13.	North of Shiráz	(?)
14.	Kushkizard, between Shiráz and Isfahán	8000
15.	Isfahán	5000

Description:—General form rather stout, head and body depressed, tail long, from 1½ times to nearly twice the length of the head and body. The head is rather flat, triangular, broader in males than in females, the breadth at the ear orifices in the former being equal to the length. The fore-leg when laid back extends to the thigh in some specimens, in others it falls somewhat short of it; the hind-limb nearly reaches the ear when laid forwards. The third and fourth toes on the fore-foot differ but little in length, the fourth being just perceptibly the longest; on the hind-foot the fourth toe exceeds the third by less than half the length of the claw. All the claws are strong and curved. Adult specimens measure when perfect 16 to 17 in. in length; head and body, from nose to anus, 6 in.; tail, 10 to 11 in. In such a specimen the head alone measures 1.6 in.; fore-limb 3; third fore-toe, without claw, 0.6; hind-limb 4.75; third hind-toe, without claw, 0.75.

The scales on the upper surface of the head are mostly smooth, especially those of the supraorbital and occipital regions; on the snout the scales are often bluntly keeled. The nostril is of moderate size, directed a little backwards, and situated on the *canthus rostralis*, which is sharp just in front of the superciliary ridge, and then appears interrupted by the nostril. There are two or three scales between the nasal shield and the rostral, and the same number between the former and the upper labials. Rostral nearly twice as broad as it is high, and twice as broad as the supralabials; mental (or lower rostral) the same breadth as the rostral, but longer and pointed behind. Labials very little larger than the adjoining scales; about fifteen, or rather more, may be counted on each side of each jaw. Scales at the side of the head keeled, those near the upper labials longitudinally elongate. The margins of the tympanum and sides and back of the neck are ornamented with groups of well-developed flattened spines, less developed in the females: of these tubercular groups of spines, there are two on each side of the back of the neck, the posterior pair being more widely separated than the anterior ones: round the tympanum are five almost equidistant groups, the largest, bearing the longest spines, being just behind the ear-opening, and there are three or four much smaller groups in an horizontal line under the ear, the hindmost of them being at the extremity of the anterior throat-fold, some of the scales on which have distinct spines in old specimens.

The scales of the occiput are keeled and pass gradually into the small scales of the back of the neck. In the centre these are raised into a small longitudinal ridge or rudimentary crest. The scales of the back are imbricate, equal in size, all keeled, and terminated by small points; there are usually about 15 or 16 (in extreme numbers 13 to 19) enlarged scales across the centre of the back, arranged in slightly oblique lines converging behind; they are abruptly separated at the sides from the small rhomboidal scales of the flanks; the ventral scales are also rhomboidal, larger than those of the sides, though smaller than those of the back, and arranged in transverse and oblique series; they are quite smooth, and pass gradually into the scales of the sides, which are for the most part not keeled, though they are pointed behind. There are no enlarged spiny or tubercular scales scattered over the sides. The scales above the limbs and tail are sharply keeled and terminate in points, and the scales above the shoulder are almost spines in some specimens. Scales on the lower part of the tail not keeled near the base. The tail scales are in more or less distinct rings.

Besides the double fold beneath the chin there is a very distinct fold across the back of the neck, single in the middle, more or less distinctly double at the sides; and from the side of the neck another fold begins, which runs at first upwards and backwards above the shoulders and then descends gradually along the sides to the anterior lower portion of the thigh. In many specimens there is a well-marked but small fold below, inside the thigh, and three or four slight folds at the back of the thigh. There are, in the males only, three or four rows of thickened scales in front of the anus, and a small oval patch, five

Pl. XIX.
Zoology of Persia

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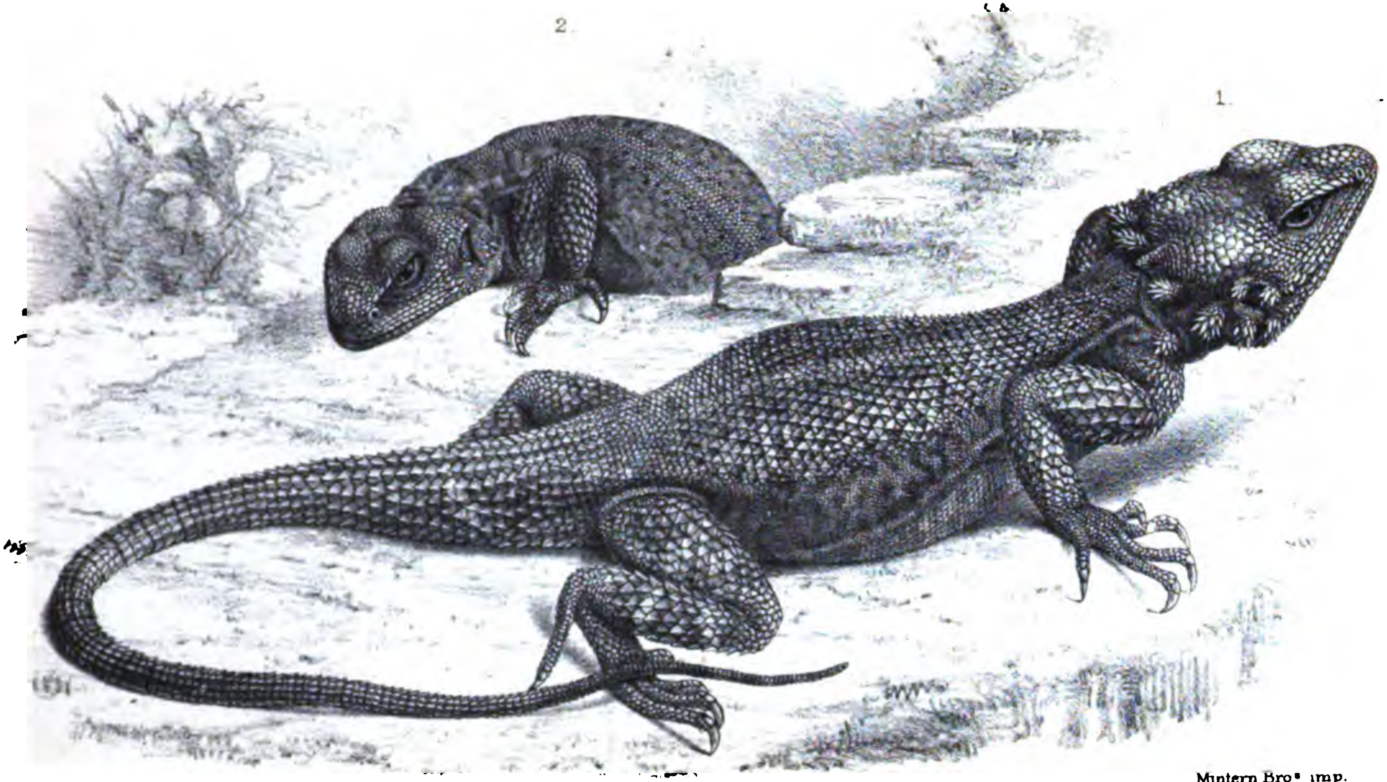


G H Ford lith.

Mintern Bro^s imp.

1. STELLIO NUPTUS
2. S. MICROLEPIS.

to seven scales long and five or six broad, of similar thickened scales in the centre of the abdomen. Both of these are wanting in females.

The general colour above is pale yellowish brown, sometimes more or less dusky, the upper part of the limbs, the fore limbs especially, and the end of the tail being often dusky or black, but the distribution of dark and light colouration varies much. The chin is cobalt blue, more or less mottled and veined with yellow; the abdomen the same in front, but paler.

Stellio nuptus is found on rocks, walls, and buildings. It is often very common about towns and villages on the old walls, tombs, etc. built of earth hardened by exposure or of unburnt bricks, but it is equally abundant in places on rocky hills far from dwelling-places. It is insectivorous. I captured one in the act of devouring a small scorpion, and I have found remains of insects in the stomachs of such as I have examined, mixed, however, with remains of vegetables. I found ten eggs, each three quarters of an inch long, in the oviducts of a female captured at Karmán in May.

I met with this species first in the highlands of Balúchistán at 3000–4000 feet above the sea, and found it abundant thence in many places throughout Southern Persia, as far north as Isfahán, where it is common on the old walls near the suburbs of Julfa. I never saw it in Northern Persia. Major St. John informs me that either this species or a closely allied one is very abundant in the rocky pass called Míyán Kotal, between Shiráz and Bushire. If the species be the same, it is probable that this lizard is also found in the Zagros mountains west of Shiráz.

De Filippi (Viag. in Persia, p. 353) states that the dorsal and caudal scales are finely pectinate. I do not find this character constant; in some specimens the edges of the scales show distinct comb-like serration, especially on the upper basal portion of the tail, but in others I can see no trace of this character. It is by no means confined to the upper parts, but may be traced distinctly on the throat and abdomen in some specimens. It is entirely confined to the lower or cuticular layer of each scale, and is best seen when the epidermal or horny portion is removed.

9 a. S. nuptus, var. *fuscus*.

1. Kalagán, Balúchistán	3500
2. Near Jálk, Balúchistán	3000

S. *differt a* S. nupto *typico plicâ nuchali carente, squamis supracollaribus paullo majoribus, colore subnigro.*

These two specimens differ from all others in their very dark colour, in the absence of the fold on the back of the neck, and in the scales of the same part being not quite so minute as in the typical form ; but I feel a little doubt about distinguishing them specifically, because in one there appears a tendency to a rudimentary fold above the neck, and because the specimen of the typical form from Sib, near Dizak, in Balúchistán, shows a smaller fold than those from Karmán and Shiráz. The colouration too may be partly due to the season, and it is variable in Persian specimens.

The following is the colouration of the Kalagán lizard noted when fresh :—General colour black, the under parts from the throat and nearly the whole of the limbs and tail being entirely of that colour, but the upper parts of the head and body and the sides are speckled with brownish white, and the chin and throat are mottled whitish and dusky. Usually on the upper parts there is a brown spot in the middle of each scale, the edges being black.

10. S. liratus, W. Blanf. Pl. XX, fig. 2.

Ann. and Mag. Nat. Hist. June 1874, xiii, p. 453.

1. Samán, Dasht, Balúchistán, near sea level.

S. *supra fuscus, nigrescente transversim fasciatus; a valde affini* S. melanurâ Blyth, *squamis supracaudalibus caudæ basin versus haud carinatis, plicâ nuchali præsente, et forsan squamis carinatis ad medium dorsum majoribus distinguendus. A* Stellio nupto *differt squamarum carinis ad medium dorsum in lineis parallelis dispositis, ad latera postice divergentibus, ipsis squamis dorsalibus utrinque gradatim diminuentibus, et colli lateribus vix spinosis.*

Hab. in Gedrosiâ (Balúchistán) haud procul a Gwádar.

Description :—General form moderately stout, depressed, tail much longer than the body, head rather flat, the breadth behind about two-thirds of the length. The fore-limb, laid back, extends to the thigh, or rather beyond ; the hind-limb, laid forward, reaches in front of the ear. The fourth toe on the fore-foot very slightly longer than the third ; on the hind-foot the fourth toe exceeds the third by the length of the claw. Claws rather small, well curved. The only specimen obtained, a female, measures 4 in. from the snout to the anus ; the tail is imperfect; the head barely 1 in.; the fore-leg, to the end of the toes, measures 2 in.; its third toe, without the claw, 0.35; the hind-leg 2.95; its third toe 0.55.

The scales of the upper part of the head are transversely keeled on the occiput, smooth in the convex superciliary regions, convex or bluntly keeled longitudinally on the snout. Nostril in the hinder part of a small nasal shield in the middle of the *canthus rostralis*, separated by two scales from the rostral, and with two or three between it and the upper labials. Rostral twice as broad as it is high, and more than twice the breadth of the adjacent supralabials. Mental the same breadth as the rostral, acuminate behind. About fourteen upper and fifteen lower labials on each side. The sides of the head are covered with keeled scales, very small near the tympanum and immediately round the eye. A group of spinose scales in front of the large tympanum, and a very few scattered spines below and behind it. (In males these spines may be more developed, and the head is perhaps broader.)

The scales of the back of the neck are very small; in the middle, a little behind the occiput, commences a row of larger keeled scales, forming a rudimentary crest. These are continued backwards and join the enlarged dorsal scales. In the middle of the back are six or seven rows of large keeled scales, the keels forming continuous parallel lines; towards the sides the scales gradually diminish in size, and the keels, still forming continuous lines, diverge backwards. The lateral scales are small, all being keeled; the ventral scales are flat and rhomboidal, much larger than the lateral ones, but not half as large as the median dorsal scales; they pass gradually into the smaller lateral scales. I count 120 to 130 scales round the middle of the body; those on the sides and abdomen are all in transverse series. No enlarged scales on the sides. The scales above the limbs are sharply keeled and pointed, those above the base of the tail are pointed but not keeled, those below the tail towards the base are smooth and rounded, the remainder of the tail scales are keeled and pointed. None are in distinct rings.

A fold across the back of the neck, single in the centre, dividing into two immediately at each side. Two or three folds across the throat; a fold from the side of the neck over the shoulder, running back towards the groin. The only specimen being a female, there are no thickened præanal or abdominal scales.

Colour, when fresh, dusky above, with imperfect blackish transverse markings; a small blackish pit before each shoulder.

The only specimen procured was found on rocks in some barren hills near the halting-place called Samán, in the Dasht province of Balúchistán, four marches west of Gwádar.

This species is evidently close to *S. melanura*, Blyth, of which I have no specimen for comparison, but judging by the fact that Dr. Anderson was at one time disposed to consider *S. melanura* the young of *S. Dayanus*, Stol., I can only suppose that the dorsal scales in *S. melanura* must be considerably smaller than in the present form; and this is rendered more probable by the number of scales round the body being greater in the former, 149 according to Anderson. Anderson gives 53 as the number of smooth ventral scales in *S. melanura;* in the present species they are less numerous, but they pass so gradually into the small lateral scales that it is impossible to assign any exact number. The present form is also distinguished apparently by having a fold at the back of the neck as in *S. nuptus*, and by the scales above the tail near the base not being distinctly keeled. *S. melanura*, too, is said to have the tail scales in distinct verticils, but in some allied forms of *Stellio* this character is somewhat liable to variation. I have not seen any species in which the annulation is so indistinct as in the present.

From *Stellio nuptus* the present form may be immediately distinguished by the keels of the dorsal scales forming parallel lines in the middle of the back, instead of converging behind, and by the enlarged scales of the back passing gradually into the smaller scales on the sides. Judging too from the present specimen, *S. liratus* is a much smaller form, with very few and small spines at the sides of the neck and around the tympanum.

11. **S. Caucasicus**, Eichwald, Pl. XX, fig. 1.—De F.

Eichwald, Zool. Spec. iii, p. 187.—Fauna Casp.-Cauc. p. 80, Pl. XIII (Osteology).—Gray, Cat. Liz. Brit. Mus. p. 255.—A. Dum. Cath. Méth. p. 105; Arch. Mus. Hist. Nat. viii, p. 578.—De F. Viag. in Persia, p. 352; Bull. Sc. pp. 198-200.—Ann. and Mag. Nat. Hist. Ser. 3, xix, p. 145.

Lacerta muricata et *L. Stellio*, Pall. Zoog. Ros. As. iii, pp. 20, 21.

Stellio vulgaris, Mén. Cat. Rais. No. 219, p. 64.

S. Persicus, Anderson, P. Z. S. 1872, p 382, fig. 4 (*fig. mala*).

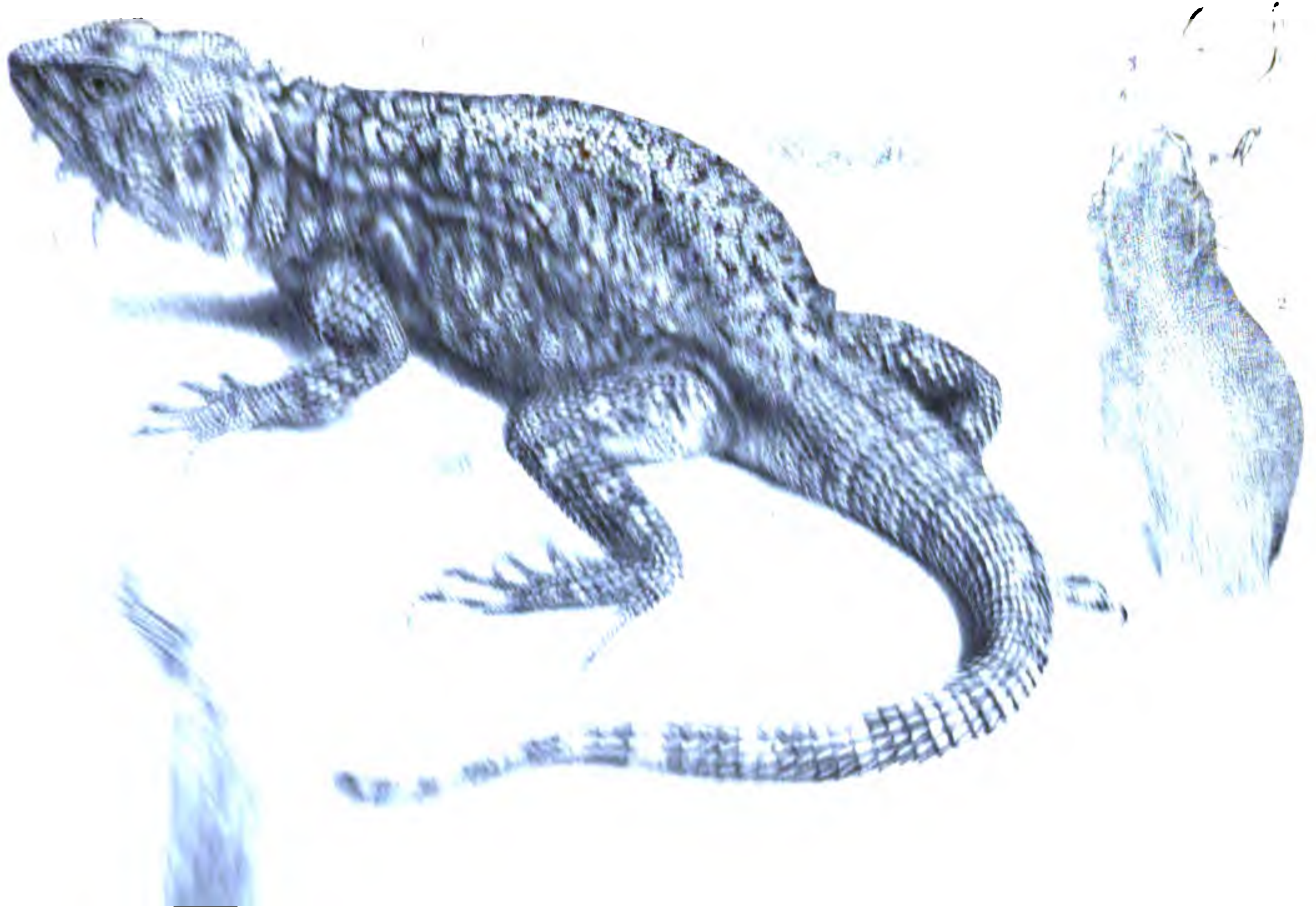
1-10.	Kobrúd, north of Isfahán	7000-8000
11-16.	Elburz mountains, north of Tehrán ..	5000-7000
17-21.	Elburz mountains, north of Kazvín ..	4000-5000

Although I have not, for want of specimens, ventured to keep the species from the Caucasus distinct from that inhabiting the Elburz and other ranges in Northern Persia, I am not quite convinced that they are identical. A single specimen in the British Museum from Elizabethpol, Transcaucasia, differs from Elburz examples in colour, in having all the scales of the centre of the back sharply keeled, and in having fewer scales, about 135, round the body. The original types of Eichwald came from the Caucasus, near Tiflis, Bákú, etc., but he identified with them specimens from the Tálish mountains which are almost certainly of the same species as those from the Elburz; in describing the species in the 'Fauna Caspio-Caucasica,' he calls the central back scales subcarinate, and his description generally agrees with the Elburz form, so that it is by no means improbable that the Elizabethpol specimen may belong to a species inhabiting Armenia, not the Caucasus. Anderson's typical specimen of *S. Persicus* differs in no respect that I can see from young specimens of the Elburz species, identified by Eichwald with *S. Caucasicus*. At the same time, should the Caucasus form prove distinct, Anderson's name will stand for that of Northern Persia. In young specimens of the latter the enlarged scales in the centre of the back are distinctly keeled, but with age the keels disappear more or less. There is no distinct line of smaller scales along the vertebral line, and in adults there are decidedly spinose scales scattered over the sides. As no complete description taken from adult specimens appears to have been given, I append the following, for the purpose of facilitating comparison with the form next to be described.

Descriptions:—General form stout, much depressed; tail, depressed near the base, 1¼ to 1⅓ times the length of the body; the fore-limb does not reach the thigh, the hind-limb about reaches the ear or falls a little short of it. Head flat, triangular, its length exceeding its breadth. The fourth toe on the hind-foot exceeds the third by about half the length of the claw. In a large specimen, the head and body, from the nose to the anus, measures nearly 6 in. Judging from other specimens, this would, if the tail were perfect, be about 14 in. long. The head measures 1.55, fore-limb to end of toes 1.75, hind-limb 4 in.; third toe of hind-foot, without the claw, 0.75.

The scales on the supraorbital bosses are smooth as usual, and rather smaller, especially near the superciliary ridges, than on other parts of the head. Those on the occipital region are smooth in front, but towards the hinder portion they bear compressed spines. Scales of the snout convex; *canthus rostralis* well marked; loreal region concave; the nasal shield is just below the *canthus*, usually separated by two shields from the rostral, and by three longitudinal rows from the upper labials; nostril in the hinder portion of the scale, and directed backwards. The scales of the snout and sides of the head and some of the occipital scales have brown dots on their outer or lower margins. Rostral broader than high, about twice as broad as the adjoining labials; mental the same breadth as the rostral, bluntly pointed behind. There are about twelve upper and thirteen lower labials; two or three rows of elongate scales along the edge of both upper and lower labials, those on the upper jaw being keeled. A line of sharply-keeled enlarged scales (sometimes two rows) runs back from under the eye to over the tympanum, which is large. Enlarged spinose conical scales, more or less arranged in groups before, below, and behind the tympanum; the largest patch is usually behind: there is another group a little further back on the side of the neck, and several smaller groups of similar enlarged conical scales scattered over the lateral portions of the neck above, but none in the middle, and there is no trace of a crest.

The back of the neck is covered with minute granules, amongst which the spiny groups of scales are scattered. Just before the shoulders these pass gradually, in the middle of the back, into larger scales, which form a not very broad line down the centre of the back. They are rather irregular in shape and size, not arranged in rows, subimbricate, and keeled in young specimens, but smooth in adults. Sometimes they are smaller in the middle, but not always, and usually from seven to ten may be counted across. The sides of the back and the flanks are covered with very small keeled scales, arranged in transverse series, scattered amongst which are larger conical scales, often in small groups. Towards the middle of the body, separated by an area of smaller scales from the enlarged vertebral series and joining the ventral scales, there is a somewhat conspicuous patch of larger scales, keeled and submucronate, unequal in size. The ventral scales are smooth, rhomboidal, in transverse series, containing, in the middle of the abdomen, about fifty-five to sixty scales. I count 150 to 160 scales altogether round the middle of the body, but owing to the irregular



size of the scales the number is variable. The chin scales resemble those of the abdomen, but are smaller; those beneath the neck smaller still. Scales above the limbs strongly keeled and spinose, those on the thigh as large as the caudal scales; behind the thigh are some scattered spinose scales amongst smaller ones. Scales below the limbs smooth. Tail scales strongly keeled and spinose, except below near the base; all are in distinct verticils.

No distinct nuchal fold: there are two distinct folds on the sides and lower portions of the neck. The fold running back from the neck over the shoulder is not so distinct as in *S. nuptus*, nor is it continued in the same way down the sides to the inguinal region. In front of the anus are several rows of thickened scales, as many as six to eight in adults, those in front being smaller; and a large oval patch of similar scales occupies the centre of the abdomen, rather nearer to the vent than to the throat. This also increases with age; in old males I find it occupies in the centre forty-five to forty-eight transverse rows of scales, and where broadest comprises about twenty-six scales, and it is 2 inches long by 1½ broad. There are the same thickened præanal and abdominal scales in adult females, but they are much fewer in number.

Colour:—Head pale olive above, paler than the body: the enlarged scales in the middle of the back are also pale, often whitish, but generally with black scales scattered amongst them. The rest of the upper part of the body varies from greyish to dusky olivaceous, with more or less distinct transverse bands of white or pink, black-edged ocelli; these are usually well marked near the shoulders, but not on the loins. Occasionally the sides, which are usually darker than the middle of the back, are sooty, the enlarged scales being always pale coloured. Limbs olivaceous to dusky above, the fore-limbs with irregular pale cross-bands. The tail pale olive to whitish, usually with irregular transverse dusky marks. Lower parts usually pale, often with a pinkish or salmon tinge; the breast and abdomen in old specimens are often dusky, and the skin is frequently veined or marbled with dusky marks.

Stellio Caucasicus abounds on the Elburz mountains, especially on the northern slope in the upper portion of the Mazandarán and Ghílán forest region. I met with it up to 7000 feet, or perhaps rather higher. I never saw it in the plain of Tehrán, and I think it probable that Dr. Anderson's specimen of *S. Persicus* was from the Elburz north of the city. I also met with this lizard in the greatest abundance at 7000 to 9000 feet above the sea on the range of high hills crossed by the road from Isfahán to Tehrán, near Soh and Kohrúd, three to four marches north of Isfahán. There is nothing peculiar in their habits; they are, like all Stellios, so far as I have seen, strictly diurnal lizards, coming out as soon as the sun's rays acquire sufficient elevation to warm the earth in the morning, and hiding at night and in cold weather beneath stones or in the fissures between rocks. In winter, I am informed by Major St. John, none are to be seen. I believe that, like most reptiles, they keep to one spot; I have certainly seen one and apparently the same lizard occupy the same stone day after day. Professor De Filippi has noticed that they are chiefly herbivorous; I have found remains of insects in the stomachs of all which I have examined, mixed with fragments of herbaceous plants, chiefly small stems. I did not find seeds.

A full account of the osteology of this species is given by Eichwald in the Fauna Caspio-Caucasica. He gives fifteen as the number of teeth in each ramus of each jaw, besides the two elongate incisors on each side in front. I find only fourteen maxillary teeth in my specimens on each side. In old specimens they are much worn.

12. S. microlepis, W. Blanf. Pl. XIX, fig. 2.

Ann. and Mag. Nat. Hist. June 1874, xiii, p. 453.

1–4.	Khán-i-súrkh pass, north of Sarján, between Karmán and Shiráz, South Persia ..	9000
5–14.	Kushkizard, between Shiráz and Isfahán ..	8000

S. Caucasico *affinis, sed squamis præsertim in medio dorso, inter humeros, minoribus et coloribus magis fuscis distinguendus. Squamæ circum medium corpus plus quam* 200, *cum in* S. Caucasico 150–160 *duntaxat numerantur.*

Hab. in montibus Persiæ meridionalis.

It is quite unnecessary to give a detailed description of this species, which is so closely allied to *S. Caucasicus* that the characters of that species apply equally to *S. microlepis*, with the following exceptions. The scales in the present form are all smaller. I count always considerably more than 200, usually 210 to 220, round the middle of the body. The enlarged scales down the middle of the back are decidedly smaller, and they diminish in size on the sides and pass more gradually into the lateral scales. They also decrease rapidly in size in front; between the shoulders they are always much smaller than in *S. Caucasicus*, and there appears always a longer space on the back of the neck between them and the occiput.

The scales of the supraorbital bosses are very little smaller than those of the occiput, except close to the superciliary ridges. The brown dots on the scales of the snout and loreal region are faint or wanting. The labials are rather more numerous, usually thirteen to fifteen in the upper and about fourteen to sixteen on each side of the lower jaw, but the number varies. The spinose scales around the tympanum and on the sides of the neck are a little smaller. As a general rule the head and limbs are rather smaller and the tail rather shorter, but this is only well seen on comparing adult males. There are the same large patches of thickened scales on the abdomen and before the anus, but the scales themselves are a little smaller.

The general colour is dusky olivaceous, the scales in the middle of the back never being conspicuously paler as in *S. Caucasicus*, and being frequently darker than the sides. The whole colour is more uniform than in the Northern form; the cross-bands of pale spots are very much less marked and smaller.

I met with this species in two localities, both at a considerable elevation, in Southern Persia; first on a high pass, about 9000 feet above the sea, near Khán-i-súrkh, on the road from Karmán to Shiráz, about 100 miles south-west of the first-named city; secondly, at about 8000 feet above the sea, near Kushkizard, on the high plateau traversed about half-way from Shiráz on the road to Isfahán. Both of these passes traverse portions of the same range of hills, and this lizard may probably be found throughout the higher parts of the chain. I nowhere saw *Stellio microlepis* at an elevation much below 8000 feet above the sea. Its habits, so far as observed, are precisely similar to those of *S. Caucasicus.*

13. **Phrynocephalus Olivieri**, Dum. et Bibr.—De F.

Olivier, Voy. Emp. Othm. Eg. et Pers. Atlas, Pl. XLII, fig. 1.—Dum. et Bibr. Erp. Gén. iv, p. 517.—De F. Viag. in Persia, p. 354.—Anderson, P. Z. S. 1872, p. 386.

P. Tickellii, Gray, Cat. Liz. Brit. Mus. p. 260.—Günther, Rept. Brit. Ind. p. 160.

1–23.	Ghistigán, Bampusht, Balúchistán	3000
24–28.	Dizak, Balúchistán	4000
29–31.	Magas, Balúchistán	4500
32, 33.	Near Bampúr, Balúchistán	1500
34–38.	Near Rígán, Narmashír, south-eastern Persia	2500
39, 40.	Near Bam, south-eastern Persia	4000
41–44.	Rayín, south-east of Karmán	7000
45–50.	South Persia	—
51.	Near Isfahán ?	—

I have examined the single type specimen of *P. Tickellii*, said to be from Afghánistán, in the British Museum. It is much dried and shrunk, and the scales on the limbs have contracted so much as to appear keeled in places, but I have no doubt of its being identical with *P. Olivieri*, as was suggested by Dr. Günther in the 'Reptiles of British India.'

The colouration varies a good deal in fresh specimens, and changes greatly in those preserved in spirits. The following note of the colour was taken from living animals. Above olive grey, drab, or dusky. Along the middle of the back in many specimens is a well-defined oval patch, extending nearly from the shoulder to the loin, and one-third the width, of a decidedly pink or pale purplish colour. A dark band crosses the back behind the shoulders, and another in front of the thighs, and these are often united by longitudinal bands, one along each side, but these markings vary greatly, and are often wanting. There is, in many cases, a fine whitish speckling on the back. On each side of the neck above are two short dark longitudinal marks, occupying slight depressions ; between them and below the lowest are raised folds covered with tubercular scales. There are in some specimens dusky spots on the labials. The limbs are marked above with transverse bands. Tail greyish above, white below, with five to seven perfect black rings, which are jetty black beneath. Remainder of lower parts pure white. The length varies from 3.5 to 4.5 inches, the tail from the anus being ¼ to ⅗ longer than the head and body.

P. Olivieri inhabits gravelly or stony plains. I have occasionally seen one take refuge on a small bush when I have been endeavouring to capture it, but I never at other times noticed it on bushes. Neither this nor any other of the Persian species inhabits holes, nor have I noticed any in pairs as was observed by Theobald in the case of *P. caudivolvulus* (J. A. S. B. xxxi, 1862, p. 518, and xxxvii, pt. 2, extra number, Cat. of Rept. p. 40). The tail is not prehensile; nor have I ever seen it coiled, but it is extremely flexible; it never appears to be reproduced, and very rarely lost or defective. I do not think *P. Olivieri* is viviparous (cf. Theobald on *P. caudivolvulus*, l. c.). I find in each case four eggs of rather large size, about half-an-inch long, in pregnant females captured about the end of February and in March. The food of this lizard consists chiefly of ants. I have not in any case detected vegetable substances in the stomach[1].

I found *P. Olivieri* abundant in most parts of Southern Persia and Balúchistán, at elevations from 2000 to about 7000 feet above the sea, keeping chiefly to open semi-desert stony or gravelly plains, but not on sand. I met with it commonly near Isfahán, but farther north it became very scarce, and I am not sure that it occurred near Tehrán, where it appeared to be completely replaced by *P. Persicus*. De Filippi also received it from Southern Persia only. Around Shiráz and Karmán it is common.

14. **P. Persicus**, De F.

De Filippi, Archiv. p. la Zool. Gen. ii, p. 387; Viag. in Persia, p. 353.—Anderson, P. Z. S. 1872, p. 388, fig. 5.

1–27.	Kushkizard, between Shiráz and Isfahán ..	8000
28, 29.	Between Tehrán and Kazvín	4000

I have compared my specimens with De Filippi's types in Turin, and they are undoubtedly the same lizard. I believe the species to be distinct from *P. helioscopus*, Pall., of which there are specimens from Siberia in the British Museum, but not on the same grounds as Prof. De Filippi; and I may mention that I feel much doubt whether the *P. helioscopus* of that writer from Armenia is really identical with Pallas's species. *P. Persicus* appears to me to differ from *P. helioscopus* in having the back scales neither keeled nor as a rule distinctly imbricate, in the scales below the head not being imbricate, the scales above the limbs being as a rule smooth, or sometimes very faintly keeled, on the fore-arm and tarsus especially, and by the enlarged spinose scales of the upper parts being much larger. In *P. helioscopus* all the scales of the upper parts are bluntly keeled, those of the back and also those of the chin and throat over-lapping the next scales at their posterior margins, and the dorsal tubercles are much smaller. The colours also differ somewhat. I give the fresh colouration of *P. Persicus* below.

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[1] I may remark that I greatly doubt if there is any close affinity between *Uromastix* and *Phrynocephalus*, as suggested by Theobald. *Phrynocephalus* I consider as most nearly allied to *Agama* and *Trapelus*, *Uromastix* I agree with Theobald in looking upon as the type of a distinct sub-family at least (see foot-note to p. 334).

With reference to both De Filippi's and Anderson's descriptions (P. Z. S. l. c.), I note the following characters from the series before me. The scales between the nasals vary from two to five, the commonest number in my specimens being three (five is the number given by both De Filippi and Anderson); they are irregular and not in distinct rows, except occasionally in the middle, where in some specimens there is a vertical row of enlarged keeled scales. The ordinary scales of the back are subimbricate in general rather than imbricate; often in the middle of the back they have no tendency to overlap. The scales on the lower portion of the posterior half of the tail are bluntly keeled and arranged in longitudinal rows. The number of enlarged scales on the edge of the eyelids varies somewhat, but is usually about the number given by Dr. Anderson; twelve on the upper, ten on the lower. The number of labials varies greatly; I count in various specimens twenty-nine to thirty-five round the upper lip. The dental formula in fully adult animals is $m\,\frac{10-10}{10-10};\ i\,\frac{3-3}{2-2}$, but except in rather old specimens some of the teeth are often deficient, and in the young it is impossible by an inspection of the mouth to distinguish the anterior molars from the incisors. When full grown the outer pair of incisors (? canines) are longer than the other teeth. The crest on the nape is very variable, and more often wanting, in Southern Persian specimens at least, than present. The edges of the toes on the hind-feet are slightly fringed, especially the outer edge of the fourth toe, but not those of the fingers; the animal is not a digger. The figure in the 'Proceedings of the Zoological Society' is not good, the head being much too large.

To the above I may add that the scales above the head are tubercular, bluntly keeled or submucronate. The tail varies in length from a little less than that of the head and body to a little more. A large specimen measured 4.75 in. in length, of which the tail from the anus was 2.3, fore-leg 1.05, hind-leg 1.55. In another specimen, 4.25 in. long, the tail measured 2.3.

The prevailing colour above is sandy, below white. There are no distinct cross-bands on the body or tail, but there are large dusky spots on each side of the latter. There are often a pair of large spots on the sides of the back, one behind the shoulders, the other before the thighs, and small spots on the upper parts of the limbs and sides of the head. In many specimens there is a large greyish-blue or pale indigo patch of considerable size on each side of the neck, with the upper margin bright scarlet. In a few specimens the under parts were dingy red, and in one the lower portion of the tail was pale green, becoming red near the anus. These bright colours on the lower parts are probably seasonal. In most specimens the under surface of the head is mottled with dusky grey.

The habits of this species appear to me identical with those of *P. Olivieri*. It inhabits similar plains, does not live in holes, and when pursued takes refuge, not under stones or in the ground, but amongst the roots of bushes or on the bushes themselves. Its food, too, consists largely of ants.

I first met with *P. Persicus* near Kushkizard[1], on the plateau, 8000 feet above the sea, traversed by the road from Shiráz to Isfahán. It abounded on the same open plain with scattered bushes, on which I found *Ablepharus bivittatus*, another North Persian species not met with elsewhere in Southern Persia. I again found this *Phrynocephalus* abundant near Tehrán at a much lower elevation, 4000–5000 feet above the sea.

15. P. maculatus, And.

Anderson, P. Z. S. 1872, p. 289, fig. 6.

1–3.	Near Bam, south-eastern Persia	3000
4–7.	Karmán	5000
8.	Salt marsh, Sar-i-júm	5000
9–12.	Between Karmán and Shiráz	(?)

Although my specimens differ from Dr. Anderson's description in colouration, in the number of teeth, and a few minor points, I have ascertained by comparison with the type that the species is the same. The colour varies, and some of the teeth in Anderson's specimen were deficient, owing to its being immature. I give a fresh description from adults.

Description:—General form rather depressed, similar to that of *P. caudivolvulus;* head not quite so short, body not so broad, as in

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[1] The locality whence Anderson's specimens were obtained was near this, but on another road from Shiráz to Isfahán. 'Awada,' seven days north of Shiráz, is a misprint or misreading for Abádeh.

P. Olivieri; limbs and tail longer. In adults, the fore-limb laid back reaches the thigh, the hind-limb laid forward extends about to the eye, in younger specimens to the end of the snout; the tail exceeds the body in length by from one-third to one-half. The base of the tail is depressed and very slightly dilated, the tail tapers gradually, is much thicker in proportion than in *P. Olivieri*, and can be coiled upwards near the end. Toes strong and moderately long, very little serrated at the edge; the fourth toe on the hind-foot exceeds the third by twice the length of its claw. Claws strong, very little curved, of a yellow colour; the claw of the fifth toe on the hind-foot is double the length of the others. Maxillary teeth (molars) $\frac{10-10}{10-10}$, incisors $\frac{3-3}{2-2}$, the outer pair of the latter in each jaw being elongate. A large specimen measures 7.25 inches, of which the tail from the anus is 4.2; the fore-limb is 1.5, hind-leg 2.45 long, measured as usual to the ends of the toes.

Scales of the head rather tubercular, slightly unequal in size, those of the frontal region and centre of the occiput being usually rather larger; each nostril is usually in the upper part of a rather large oval shield, with a smaller crescentic shield above it, or it is between two shields, an upper and a lower; one scale (more rarely two) in the middle between the nasals. There is a fringe of moderate-sized, rather rounded scales to the upper eyelid, and of much longer pointed ones to the lower, in each case about ten in number, varying slightly. The scales on the sides of the head above the labials and some of the scales of the occiput have often pores on their lower or outer surface, but I do not find this character constant. Upper labials about 30-31; usually the last on each side is larger, and there is no distinct rostral. But there is much variation in these points; in one specimen I count 36 upper labials. The mental plate or lower rostral is larger than the other lower labials; there are two rows of enlarged scales, the lower of them the larger, but not extending far back, along the lower labials. Ears covered by small granular scales similar to those of the throat.

Scales of the back rhomboidal, smooth, in transverse rows, in the centre of the back a little larger, and gradually diminishing slightly towards the sides, granular in front of the thigh and behind the shoulder; ventral shields nearly square, about the same size as those in the middle of the back, and as a rule smooth, but in some cases I find slight keels and distinctly mucronate terminations behind on some of the scales about the middle and posterior portions. I count about 106–112 scales round the middle of the body. Scales on the limbs as a rule smooth; on the tarsus and fore-arm however they are usually, but not always, more or less keeled above and below; scales beneath the soles of the feet strongly keeled, cross-plates beneath the toes ribbed (only seen under a strong lens). The tail is covered near the base and for about a quarter of its length with smooth rhomboidal scales the same size as those of the back; the remainder is covered with keeled scales, the keels forming longitudinal lines below, but not above; all the tail scales are in rings.

Colour of the upper parts, when fresh, pale slaty grey to dusky brown, speckled more or less finely and closely with whitish, and occasionally, but by no means generally, crossed with transverse dusky bands, usually of a pinkish or coppery colour in living specimens, or marked with dark spots. The tip of the tail is always black below, and usually above also, but the distance to which the black extends from the tip varies; in front of the black portion and separated from it there are frequently one or more black rings, and the basal portion is often marked with dusky spots at the sides or banded with dusky above. Lower parts, except the end of the tail, usually white; in some cases the lower part of the tail except the tip is of salmon colour (probably during the breeding season only), and the hinder part of the thighs is bright yellow.

This *Phrynocephalus* was found in open plains, very locally distributed, and apparently keeping to more barren and sandy parts of the country than the other species. The only place where I found it common was in the great sandy plain east of Karmán. I first met with it in Narmashír, near Rígan and Bam, at about 2500 feet above the sea; the other places where it was seen were 2000 to 3000 feet higher, but it was not observed at any greater elevation. One specimen was captured on the utterly barren salt-swamp of Sar-i-júm, between Karmán and Shiráz. Anderson's examples come from Awada, evidently Abádeh, which is higher than any place where I observed this species. I also remember seeing it near Isfahán, but I have not preserved specimens, and I did not notice it further north.

P. maculatus has a habit of coiling the end of its tail upwards, or in the reverse direction to that in which a chamæleon coils it. I cannot form any idea of the use to which this animal puts its tail as a prehensile organ. The places it inhabits are as a rule destitute even of bushes, so that the tail can scarcely be employed for climbing. Although it is closely allied to *P. caudivolvulus*, I do not think it is either herbivorous or viviparous; I find only remains of insects (chiefly ants, as in the other species) in the stomach; and in two pregnant females captured near Bam on the 21st of April I find two eggs in each. Neither have I ever observed that this species burrows or takes refuge in holes or under stones[1].

Undoubtedly *P. maculatus* is closely allied to *P. caudivolvulus*. On comparing it with specimens of that species from Tibet, in the British Museum, I find the latter differ in having a shorter tail, no keels on the tail scales except close to the tips, and strong keels to the scales of the abdomen. The size is much smaller and the colouration different. Dr. Günther states, in his 'Reptiles of British India,' p. 161, that these Tibetan specimens have been compared by Prof. Peters with the type of *P. caudivolvulus* and found identical. But it is worthy of notice that Eichwald, in his 'Fauna Caspio-Caucasica,' describes the ventral scales of *P. caudivolvulus* as not keeled, and the present species, as we have seen, has them sometimes slightly keeled, so it is possible the difference in this respect is not constant.

16. Uromastix[2] microlepis, W. Blanf.

P. Z. S. 1874.

U. *affinis* U. spinipedi, *tuberculis majoribus ad latera corporis sparsis carentibus, plicis ad latera colli tuberculos parvos ferentibus, squamisque supra et infra pedes minoribus, distinguendus. Ab* U. acanthinurâ *squamis omnibus multo minoribus facile recognoscitur.*

Hab. in Mesopotamiâ juxta urbem Basrah (*Bussora*).

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[1] I mention these facts because Mr. Theobald found a *Phrynocephalus* on the banks of Lake Tsomoriri in Thibet, called at first *P. Olivieri* by the finder, J. A. S. B. 1862, xxxi, p. 518, and then *P. Theobaldi* by Mr. Blyth, id. 1863, xxxii, p. 90, but subsequently identified by Mr. Theobald himself with *P. caudivolvulus*, Cat. Rept. Mus. As. Soc. p. 40, which he described as living in pairs, inhabiting burrows, and producing living young,—two and occasionally three fœti being found in females. The same species was described apparently as *P. Stoliczkai* by Steindachner, Rept. Novara, p. 22, but identified by Günther with *P. caudivolvulus*, Zool. Record, 1867, p. 137.

[2] Mr. Theobald (Journ. Linn. Soc. x, p. 34, and J. A. S. B. 1868, Cat. Rept. p. 39) proposed to separate *Uromastix*, *Leiolepis*, and *Phrynocephalus* as a distinct family, because they are herbivorous and live in burrows. This view has been adopted by Anderson, P. Z. S. 1871, p. 167, and Stoliczka, P. A. S. B. 1872, p. 81. If maintained, however, it must be so on other grounds than those assigned by Theobald, and I do

Description:—General form massive; trunk broad, depressed; head triangular, upper portion flat behind, descending in a curve towards the muzzle. Limbs rather stout; the fore-foot laid forward extends beyond the snout by the length of the fingers, laid backward it reaches two-thirds of the distance to the thigh; when the hind-foot is brought forward, the ends of the toes nearly touch the axil. Toes strong, a fringe of pointed scales on the outer edge of the fourth toe of the hind foot, and less marked fringes on the second and third toes. Claws rather long, pale coloured. Tail thick, gradually attenuate, formed of rings of pointed conical tubercles, its length about equal to that of the body without the head and neck.

About eighteen subconical teeth on each side of the upper jaw, those in front smaller and much worn down; fifteen similar teeth much blunted on each side of the lower jaw. In front of the upper jaw is a cutting edge formed of a broad central portion, which appears to be a process of the maxillary bone, and two smaller lateral teeth, one on each side, apparently united to the central process at the base. Similarly in front of the lower jaw are two cutting edges, one at the end of each ramus of the mandible, each composed of an osseous and a dental portion, the osseous portion the broadest, and nearest to the extremity of the jaw. In young specimens the dental portion of these pseudo-incisors is more developed and the osseous portion less than in adults. Tongue deeply cleft at the end.

The largest specimen obtained measures 21 inches, of which the tail from the anus measures 8.5, head 2, fore-limb to end of claws 4.75, third toe and claw measured from the division between the third and fourth toes 1.12, hind-limb 6.25, third toe 1.22.

Scales:—Head covered above with convex scales, largest on the snout and occiput, and on the forehead between the eyes. *Canthus rostralis* rounded; nostrils lateral, oval, rather large, each in the middle of a single plate below the *canthus*. Rostral enlarged; mental smaller than the rostral. Labials scarcely larger than the neighbouring

not think *Phrynocephalus*, none of the Persian species of which live in holes or are herbivorous, and the dentition of which resembles *Agama* and not *Uromastix*, can be included. *Stellio*, on the other hand, is herbivorous, though not exclusively so. That *Uromastix*, *Centrotrachelus*, and I believe *Leiolepis*, form a well-marked section, is obvious, and they appear to me just as deserving of separation from the *Agamidæ* as are the *Sepsidæ* from the *Scincidæ*, but I prefer myself retaining the larger groups as families.

scales; posterior upper labials triangular, all others square Chin, except near the lower labials, covered with very small convex scales; scales of the neck equally small, subconical or mucronate, those of the lower surface in transverse rows. Sides of the neck with irregular longitudinal folds, bearing larger tubercular pointed scales; there are also transverse folds below the neck, but they do not bear larger tubercles. Scales of the back and sides all small, submucronate, with the points compressed and directed backward, in well-marked transverse rows except near the middle line of the back; no enlarged scales on the sides. Abdominal scales rhomboidal, a little larger than those of the back, arranged in transverse series. Scales of anterior portion of the fore-limb like those of the abdomen, those on the posterior surface the size of the back scales, a few slightly enlarged scales on the outer surface of the fore-arm. On the hind-limb the scales are larger on the inner, smaller on the outer surface; a row of large conical tubercles passes down the front of the tarsus, and large spinose tubercles are scattered over its outer surface; a few, less in size, occurring on the posterior portion of the thigh. Feet and toes covered beneath with keeled scales, the keels longitudinal on the soles of the fore-feet, transverse on those of the hind-feet. In the largest specimen, a male, there are eighteen femoral pores on one side, twenty on the other, in a younger specimen fourteen beneath each thigh, the two series coming close together in the præanal region. Tail when perfect consisting of about twenty-three or twenty-four rings, the upper and lateral portion of each ring consisting of large spines, the points directed backward; the lower portion, except towards the tip, is covered by rings of smaller nearly flat scales, diminishing in size towards the base of the tail.

Colour olive grey, with small rather indistinct darker spots on the back; lower parts and tail rather paler.

Intestinal canal elongate, but apparently less so than in *Centrotrachelus*. In a specimen measuring altogether 17 in. in length, of which the tail is 7, the whole length of the intestinal tract from the cardiac end of the stomach to the anus is 28 in., the large intestines measuring 8 in.

This species was found inhabiting the neighbourhood of Basrah, whence three specimens were brought by Captain Phillips and presented alive to the Zoological Society. It is in all probability this lizard which was first noticed in Mesopotamia by Olivier (Voyage dans l'Empire Othman, l'Egypte, et la Perse, ii, p. 428), and said to be larger and longer than a man's arm, and dwelling in holes like those made by foxes.

U. microlepis is closely allied to the African *U. spinipes* and *U. acanthinurus;* it is distinguished from the former by the absence of enlarged scales on the sides and by the lateral folds on the neck bearing tubercles, and from the latter by its much smaller scales.

17. **Centrotrachelus Asmussi**, Strauch, Pl. XXI.

Bull. Acad. Imp. Sci. St. Pet. 1863, vi, p. 479.
Boz-mich or *Boz-mijeh*, Persian (Goat-milker).

1. About ninety miles north-west of Bampúr, Balúchistán	1800
2-4. Near Rígan, Narmashír, south-eastern Persia ..	2500

This is the second of the two remarkable lizards procured at Sar-i-cháh, north-west of Sístán and north-north-east of Karmán, by Count Keyserling, when attached to Mons. de Khanikoff's expedition into Eastern Persia, and described by Strauch. The example from which the description was taken was brought alive to St. Petersburg. Strauch's description in Latin is excellent: it is reproduced in the Zoological Record for 1864, p. 115. I append a somewhat fuller account in English.

Description:—General form very massive; trunk remarkably broad and depressed; head short, subtriangular, depressed, but not very flat, about as broad as long, the frontal region descending in a curve to the blunt muzzle. Limbs stout, of moderate length; the fore-foot laid forward extends beyond the snout by the length of the fingers, laid back it reaches more than half-way to the thigh; the hind-leg laid forwards extends about three-quarters of the distance to the axil. Toes short and strong, not fringed, those of the hind-foot about the same length as those of the fore-foot, gradually increasing in length from the first to the fourth; in the fore-foot the fourth toe is very little longer than the third, in the hind-foot it exceeds it by the length of its claw. Tail very thick, rather shorter than the body and head, depressed near the base, regularly attenuate, surrounded by rings of conical tubercles. Dentition peculiar, being similar to that of

Uromastix, and differing widely from that of the insectivorous Agamoids. There are in a large specimen twenty-two subconical teeth on each side of the upper jaw; twenty, of which nineteen are subconical and one in front to be presently described, on each side of the lower. These teeth are laterally compressed and very close together, forming a continuous series, and those in front are worn down, so as to form almost a continuous cutting edge. In front of the upper jaw, separated by a small interspace from the maxillary teeth, is a broad cutting edge, like that of a human incisor, formed apparently of a process of the intermaxillary bone, and not an implanted tooth; opposed to this in the lower jaw are two cutting edges, one at each end of the row of lower molars, not separated from the lower molars by any space, but a little apart from each other. These pseudo-incisors appear entirely composed of bone, the dental portion seen in *Uromastix* being apparently deficient in the present species, or perhaps becoming so worn down in old specimens that it cannot be seen. The tongue is moderate, deeply cleft at the end. The largest specimen collected measures 20 in., of which the tail from the anus is 9.5, head 2: the body is 5 in. broad. In another smaller specimen measuring 15 in., the tail is 6.25 long, head about 1.75, fore-limb 3, third toe and claw measured from the division between the third and fourth toes 0.7, hind-limb 4.25, third toe and claw 0.7.

Frontal and occipital regions of the head and the central line joining them covered with convex tubercular scales of unequal size, but much larger than those on the supraorbital region. This is indented by a longitudinal groove just inside the superciliary ridge, which is not prominent. *Canthus rostralis* rounded, indistinct, the nostril lateral, crescentic, rather large, occupying the hinder portion of a nasal plate below the position of the *canthus*, and with the hinder margin formed of small scales. No enlarged rostral or mental; labials all small, scarcely if at all larger than the adjoining scales. Several rows of rather elongate scales parallel with the lower labials. Scales of the sides of the head mostly small; a row of rather larger tubercular or bluntly-keeled scales commences below the eye and continues upwards and backwards to above the tympanum. Scales in front of the ear slightly enlarged and conical. Tympanum rather large, its height greater than its breadth, partly concealed by the spinous folds of the neck; the membrane rather deeply seated. Chin and throat below granular.

Pl. XXI.
Zoology of Persia
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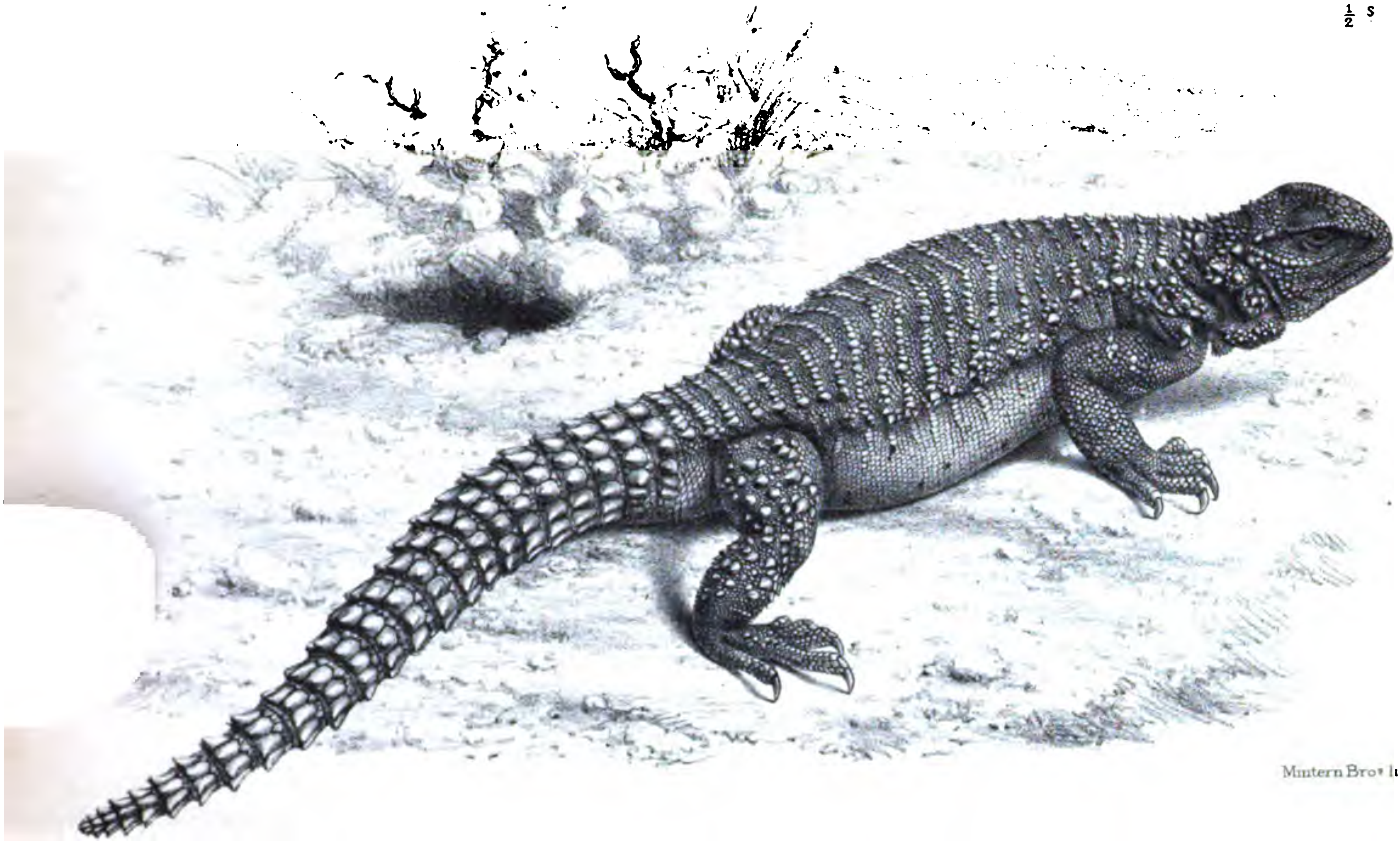

Mintern Bros lith

CENTROTRACHELUS ASMUSSI.

On the back of the occiput are some large mucronate scales, and groups of still larger spinose tubercles are scattered over the back and sides of the neck; the intervening scales small and submucronate. The back and sides are covered with small rhomboidal, subimbricate scales, obtusely keeled, and terminating posteriorly in rather blunt points; across these extend numerous transverse, equidistant rows of much larger mucronate tubercles, their points directed backwards; some on the anterior portions of the sides are spinose. Abdomen clothed with rhomboidal imbricate scales in transverse series, mostly smooth, but sometimes bluntly keeled near the sides, especially in front, nearly equal in size to the larger dorsal scales. Limbs covered with imbricate scales, more or less distinctly keeled or submucronate, much larger above than below; some very large conical scales scattered over the upper and hinder parts of the thigh and tarsus. Scales of the soles keeled, the cross-plates below the toes with several keels each. Tail in very distinct rings, about twenty-five in number, each surrounded above and at the sides by very large spinose tubercles, eight to ten in each ring, the lower portion without tubercles, but covered with keeled scales. From nine to eleven pores, showing as soft blunted tubercles, on the underside of each thigh, each pore surrounded by small scales, the row of pores extending to the præanal region but not across it. Neck with fold below and at the sides; no distinct fold across the nape.

The intestinal canal is elongate, measuring 40 in. in a specimen about 18 in. long. In a specimen of *Agama agilis*, 10 in. in length, the intestinal tract, similarly measured from the cardiac end of the stomach to the anus, is only 7 in. long: both specimens being preserved in spirit, the tissues have doubtless contracted. The stomach of *Centrotrachelus* is small in circumference but about 6 in. long. About 10 in. from the anus the intestine swells into a large sac-like cæcum, much exceeding the stomach in circumference. The rectum is thick, and longitudinally grooved externally throughout the greater part of its length, but this may be due to contraction just before death.

All the specimens collected are males. In these, when fresh, the head, limbs, and tail were blackish above; the back and sides were buff, the larger tubercles and many of the smaller ones upon the head, neck, and shoulders scarlet, the red colour gradually disappearing on the enlarged scales of the back. Probably this colour is seasonal, and may in the height of the breeding season colour all the back. Some specimens, probably females, appeared to be of a uniform yellowish olivaceous colour on the upper parts. The lower parts of the head, limbs, and tail black, more or less mottled with greyish white; abdomen pale.

This superb Uromasticid was first seen at Khusrín, five marches north-west of Bampúr, in Balúchistán, where a specimen was shot by Major St. John on a small stony rise at the edge of the Bampúr plain. We met with it more commonly along the margin of the Narmashír desert, near Rígán, a few marches farther to the north-west. This plain extends far to the northward, towards Sístán and Khorassán, and the same lizard may inhabit a considerable portion of Eastern Persia. Where seen it lived in a semi-desert, rather gravelly plain, with scattered patches of low thin bush, chiefly barilla and tamarisk. It is heavy in its movements, but can run tolerably quick. It lives in large holes resembling rabbit-holes, evidently dug by itself; I dug out one individual, which I had seen take refuge in a hole, from a depth of about 2 ft. under ground. The burrow, about 18 in. from the surface, turned at right angles to its original direction, and was altogether about 4 ft. long.

Centrotrachelus Asmussi, like *Uromastix Hardwicki*[1], is purely herbivorous, living on leaves and stems of herbaceous plants, seeds, etc. It also resembles *Uromastix* in not leaving its burrow until the sun is well up, in the cold season at all events, and in its gentle disposition. It does not attempt to bite when captured.

In the accompanying plate this lizard is represented two-fifths the natural size.

18. *C. loricatus, W. Blanf.

P. Z. S. 1874.

C. *peraffinis* C. Asmussi, *a quo colore pallidiore, isabellino nec olivaceo, fusco-maculato, squamarum majorum dorsalium seriebus magis distantibus, unguibus fortioribus, squamis supradigitalibus minoribus et carinis squamarum infra pedes posteriores in lineas transversas haud obliquas dispositis, tantum differt.*

Hab. haud procul a Bushire.

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[1] Conf. Theobald, Jour. Lin. Soc. x, p. 34.—Cat. Rept. Mus. As. Soc. p. 39, in J. A. S. B. xxxvii, Pt. 2.—Stoliczka, Proc. A. S. B. 1872, p. 81.

In all essential characters this species resembles the type of the genus very closely. I have only examined a single specimen of *C. loricatus*, and that is said to be a very small one; it is 16 in. long, and, as preserved in spirit, of a pale pinkish or cream colour, very different from the olive of *C. Asmussi*. The back is marked with small dusky spots, owing to some of the larger scales here and there being of that colour. The larger scales are arranged in rather more distant lines, and in the lines themselves they are more scattered, but the most striking difference is that there are very few spinose scales on the neck, and the enlarged scales of the back and sides are nearly flat, instead of being sharply mucronate. This, however, may be partly a sexual distinction, as all my specimens of *C. Asmussi* are males. The only example of *C. loricatus* is eviscerated, and I cannot determine the sex. The femoral pores are ill-developed and obscure, but they appear closer together and more numerous than in *C. Asmussi*. The best character, however, for separating these two forms is to be found in the toes, which in *C. loricatus* are shorter and have much stouter claws, the scales above the toes, except close to the claws, being much smaller, and the keeled scales beneath the feet having their longer diameter and the direction of their keels transverse, whilst in *C. Asmussi* they are oblique. In the specimen of the former, the third toe with claw in the fore-foot measures 0.67 in., in the hind-foot 0.6. The feet too are broader in the Bushire species, and there is a much more distinct fringe along the outer edge of the fourth hind-toe.

From the various accounts given of this *Centrotrachelus*, I believe it to be probably larger than *C. Asmussi*. The specimen I have examined is said by the gentleman who sent it to be very small. I am indebted to Major St. John for the following interesting note of its occurrence near Bushire. Major St. John also told me that he believed this lizard was a larger animal than that which we found in Narmashír.

For an opportunity of examining a specimen I am indebted to Dr. Sclater, who has been indefatigable in endeavouring to obtain from the different correspondents of the Zoological Society some of the Persian animals of which I had heard, but which I had been unable to procure. The present lizard was obtained and sent to Dr. Sclater by Mr. Ellis, who after much trouble succeeded in obtaining a specimen from the Arabs. His chief difficulty was that in the winter these lizards were never seen; doubtless they hybernate at that season, as suggested by Major St. John.

A young *Uromastix* was obtained from the south coast of Arabia by Dr. Carter, P. Z. S. 1863, p. 237. Dr. Gray, who examined the specimen, which was dried, found that it was impossible to determine the species.

[The *Centrotrachelus* I have only seen once, when riding across the desert from Shif, a small port opposite Bushire, to Borasjún, the surface being sandy clay, with small bushes of wormwood and barilla. The lizards were sitting outside their holes in the evening in May, and my bull-terrier killed two. They evinced no terror of the dog; indeed, one attacked her, and the dog's mouth was severely cut by the sharp scales of the lizard's flanks; from memory, I should say the lizard was 20 in. long. The above was the only occasion on which I have been off the regular road in summer, though I have been all over the country in winter without remarking the *Centrotrachelus*, which must therefore, I should think, be a hybernating animal.—O. St. J.]

Family GECKOTIDÆ.

19. ***Hemidactylus maculatus**, Dum. et Bibr.

I saw this species in houses at Gwádar, on the coast of Balúchistán. It may perhaps have been introduced from India.

20. **H. Persicus**, Anderson.

P. Z. S. 1872, p. 378, fig. 2 (mediocris).

No exact locality is given; I believe the species, however, to have been obtained in Southern Persia, and probably at Bushire. The woodcut is not very correct, the dorsal tubercles being represented as hemispherical and the pupil as circular.

The tubercles on the centre of the back are not distinctly trihedral, though they are keeled; they become more elongate on the loins, and are conoidal towards the sides. The tubercles on the tail are rather smaller than those on the back; they are a little irregular, but the proper number in each row is six, three on each side. Limbs moderate, the hind-foot laid forward does not extend to the shoulder, the fore-foot reaches the eye. The rostral is cleft for some distance above; nostril with three enlarged scales behind it.

21. H. *sp.* Pl. XXII, fig. 1.

1. Dizák, Balúchistán	4000

I cannot satisfactorily identify the only example of a *Hemidactylus* which I procured. It is near *H. maculatus* and *H. Persicus.* The back is covered with granular scales, thickly interspersed with rather small trihedral tubercles, none of which equal the ear-opening in size. There are about fourteen rather irregular rows of these tubercles across the middle of the back; they are rather smaller in front, and on the sides of the back and fore-part of the limbs they are smaller and indistinctly trihedral. There are about forty scales across the abdomen. Tail verticillate, towards the base the rings are marked by three or four tubercles on each side, smaller than those on the back; no enlarged subcaudal plates, and in the only specimen obtained (a female apparently) no femoral or præanal pores.

Occipital portion of the head with small round tubercles scattered over it. Eyelid circular, without enlarged scales; pupil vertical. The granular scales between the nostril and eye rather larger than those on other parts of the head. Nostrils between the rostral, first labial and three slightly enlarged scales behind. Ear-opening moderate. About ten upper and eight or nine lower labials; a row of slightly enlarged scales along the superior edge of the upper labials; only one pair of chin shields, which form a broad suture behind the mental, and only meet the first lower labial; a few enlarged scales along the edges of the lower labials.

Limbs rather longer than in *H. maculatus.* The fore-foot extends beyond the eye if laid forward, the hind-limb just reaches the shoulder. Plates beneath the toes numerous (twelve to fourteen), divided nearly to the base, the two halves meeting at a very obtuse angle.

Colour grey, with imperfect cross-bands on the back and tail; a dark line from the nostril, through the eye, and above the ear. Length 3.65 in., of which the tail from the anus measures 2 in.

This species is distinguished from *H. maculatus,* D. and B. (as restricted by Günther), by the much smaller tubercles on the tail (which has no appearance of having been reproduced in the specimen before me), by its rather more elongate form, by much smaller scales on the abdomen, only one pair of chin shields, and more numerous plates beneath the toes.

From *H. Persicus*, And., it appears to differ in being more slender, in having longer and slighter limbs, fewer scales across the abdomen and less marked tubercles on the tail. It is possible that the greater slenderness may be due to immaturity.

But a single specimen was obtained of this form, and although it appears to me distinct from *H. Persicus*, I do not name it, as it may prove only a variety.

22. **Gymnodactylus brevipes**, W. Blanf. Pl. XXII, fig. *2*.

Ann. and Mag. Nat. Hist. June 1874, xiii, p. 453.

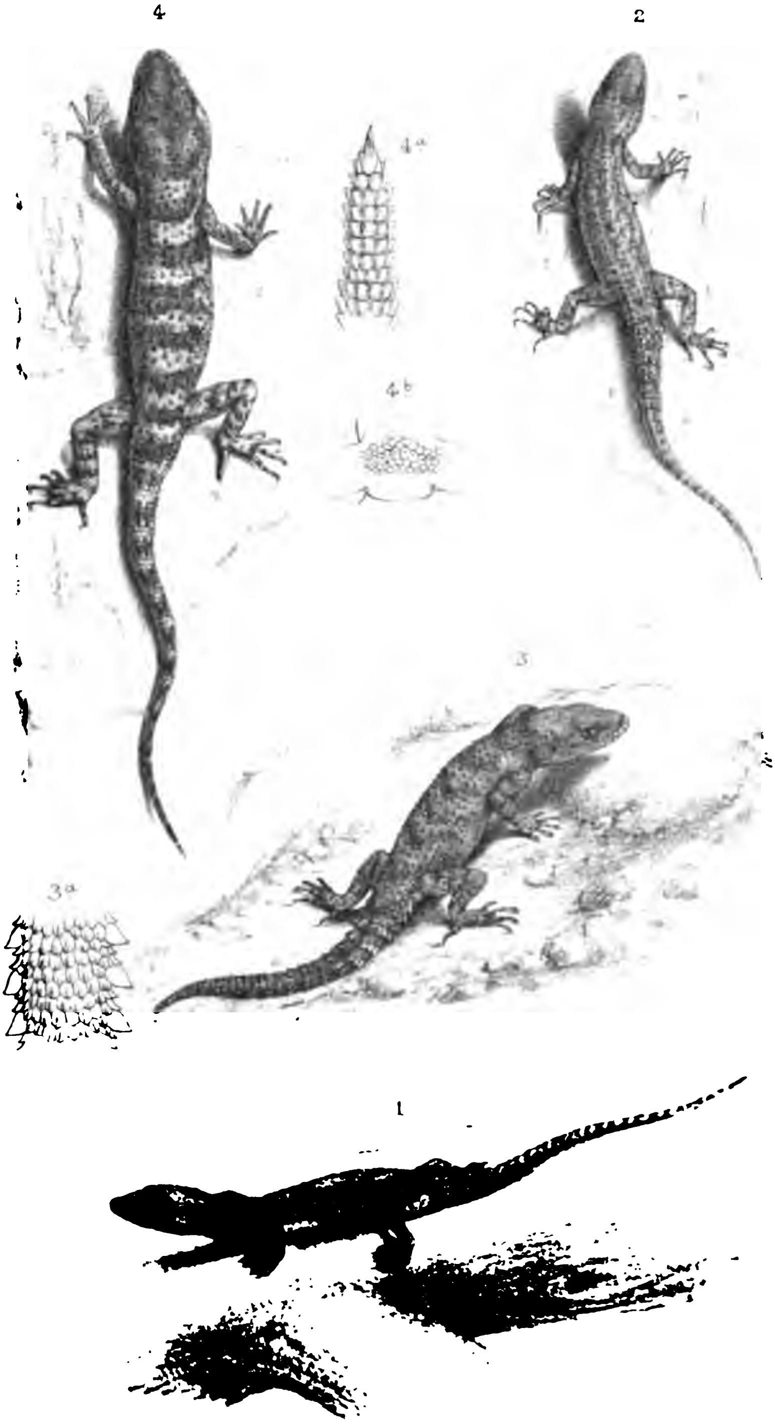
1. Aptar, near Bampúr, Balúchistán 3000

G. *affinis* Gymnodactylis geckoidi, Caspio Kachhensique, *dorso tuberculis parvis triquetris in* 10 *series longitudinales dispositis ornato, caudâ verticillatâ, annulo singulo tuberculis tribus carinatis longiusculis utrinque armato, subtus scutis majoribus* (*nonnullis divisis*) *indutâ: squamis ventralibus in serie transversâ circum* 22 ; *poris inguinalibus* 4, *femoralibus nullis, membris digitisque brevibus, pede anteriore vix ante oculum, posteriore humerum attingente.*

Hab. in Gedrosiâ (*Balúchistán*).

Head and body moderately depressed, limbs rather short. Scales of the back granular, with numerous sharply-keeled trihedral tubercles, each nearly equal to the small ear-opening in size, and all arranged in regular longitudinal lines, of which ten may be counted in the middle of the back, diminishing to six between the thighs. All these tubercles are rather longer than broad. Tail longer than body, distinctly ringed, each ring with three sharply-keeled, rather elongate trihedral tubercles (larger than those on the back) on each side, the space between the two uppermost in the centre of the tail being very little broader than the interspaces on the sides; lower portion of the tail, except at the base, covered with larger plates, many of them divided into two; when undivided they are about equally long and broad, and there are two to each ring.

Hinder part of head covered with unequally sized granular scales; scales of the anterior portion larger, equal in size, convex, not carinate. Pupil vertical, upper eyelid very short, lower wanting. Nostrils between



G. H. Ford lith. Mintern Bros imp.

1. HEMIDACTYLUS 3. G. HETEROCERCUS
2. GYMNODACTYLUS BREVIPES. 4. BUNOPUS TUBERCULATUS

the hinder edges of rostral and first labial without any enlarged plates behind. Rostral rather broader than high, deeply cleft above. Upper labials nine, lower seven on each side. Two pairs of larger chin shields, the first only in contact, the second pair smaller and widely separated; a few larger scales along the edge of the lower labials. Scales below head round, flat, those beneath the neck rather smaller, those on the belly considerably larger in the centre than towards the sides, in about twenty-two rows in the middle of the abdomen, but the passage into the granular scales of the sides is so gradual that it is difficult to say where either ends. I count about eight granules on each side between the flatter ventral scales and the lowest trihedral tubercles. Femoral pores four, in a curved row between the thighs.

The hind-limb laid forward just reaches the shoulder, the fore-limb laid back extends about two-thirds of the distance between the shoulder and thigh; laid forward the toe reaches to between the eye and snout. The longest toe of the hind-foot is about equal to the distance between the eye and nostril. Limbs covered with imbricate scales above, some larger tubercles on the anterior portion of the hind-limb only. The two last joints of each toe much smaller than the basal portion.

Colour grey, with three rather imperfect longitudinal dusky bands on the back, formed of arrow-head shaped marks. A dusky line not very strongly marked from the eye to the shoulder.

The only specimen obtained was found in an open sandy plain, with scattered vegetation, not far from Bampúr, in Balúchistán. The length is 2.95 in., of which the tail from the anus measures 1.7, fore-limb 0.4, hind-limb 0.57, middle toe of hind-foot 0.13.

This species is distinguished from all its allies, *G. Caspius*, *G. geckoides*, *G. Kotschyi*, and *G. Kachhensis*, by its much shorter limbs and feet, and especially by its short toes. It is further distinguished from *G. Caspius* by its smaller number of præanal pores, from the same species, *G. Kotschyi* and *G. geckoides*, by its more slender form, narrower and more depressed head, and narrower subcaudal shields. It differs from *G. Kachhensis* in not having subcarinate shields on the snout, in having fewer rows of tubercles on the back, and of scales across the belly.

23. *Gymnodactylus heterocercus, W. Blanf. Pl. XXII, fig. 3, 3 a.

Ann. and Mag. Nat. Hist. June 1874, xiii, p. 453.
G. Caspius, De F. Viag. in Pers. p. 352, partim, nec Eichwald.

G. depressus, capite granulis majusculis superne tecto; dorso tuberculis carinatis triquetris in seriebus 12 *longitudinalibus ornato, caudá superne verticillatá, annulis singulis tuberculis tribus majoribus utrinque ad latus instructis,* subtus squamis parvis imbricatis carinatis mucronatis indutâ; *cruribus supra tuberculis majoribus ornatis, subtus squamis parvis imbricatis carinatis tectis.*

Hab. ad Hamadán in Persiá occidentali (*Doria*).

Head and body much depressed, limbs rather short. The back covered with small granular scales, and with sharply-keeled trihedral tubercles, about equal to the small ear orifice in size, and arranged in regular longitudinal rows, twelve in number in the middle of the back. These tubercles are very little if at all longer than broad. The tail is depressed at the base, in distinct rings above, each ring bearing on each side three sharply-pointed keeled tubercles about twice the size of those on the back; there are no tubercles above the tail in the central line; between the tubercles there are small keeled imbricate scales. *The scales on the lower portion of the tail are small, strongly keeled, sharply pointed behind, imbricate, and not arranged in regular verticils.* (Pl. XXII. fig. 3 a.) This character alone distinguishes the present from all allied species, for the tail in one specimen has not the least appearance of having been renewed, except towards the end, where it is surrounded by keeled scales without any enlarged tubercles.

The fore-legs are covered with imbricate keeled scales above, with some trihedral tubercles on the fore-arm; the upper surface of the thigh and tarsus bears larger tubercles, exceeding those of the back in size. The lower surfaces of the carpus and tarsus are covered with small, sharply-keeled, imbricate scales, the keels forming regular longitudinal lines. The scales below the thighs are more faintly keeled. The fore-limb laid forward extends to the end of the snout, laid back it does not quite reach the thigh. The hind-leg laid forward extends to the shoulder. There are no femoral or præanal pores in either of the specimens examined, probably females. The scales across the belly are in twenty-five to thirty rows, and there are from three to six small scales on each side between the enlarged ventral scales and the lowest dorsal tubercles.

The head is covered above with rather coarsely granular scales, much larger than the scales of the throat, and nearly equal in size to those of the abdomen. Nostril small, in the angle between the rostral and first labial, without any enlarged scales behind. Rostral broader than it is high, deeply cleft above. Upper labials eight to ten, lower seven to eight. Mental shield triangular, rather large, with two or three pairs of enlarged chin shields behind it, only the first pair meeting behind the mental. Upper eyelid well developed, pupil vertical. Ear-opening small.

The *colour* in spirits is grey throughout, without markings. A specimen measures 3.2 in.; the tail, partly replaced but apparently full grown, being exactly one-half this length, or 1.6, head 0.45, fore-leg 0.55, hind-leg 0.78.

The only two specimens of this species which I have seen belong to the Turin Museum, and were brought by the Marquis Giacomo Doria from Hamadán. The keeled imbricate scales beneath the tail and legs serve to distinguish it from all allied forms.

24. *G. Caspius, Eichwald.—De F.

Spic. Zool. pars posterior, p. 181.—Faun. Casp.-Cauc. p. 91, Pl. XV, Fig. 1, 2. —C. Duméril, Cat. Méth. Col. Rept. Mus. Paris, p. 45.—Steindachner, Sitzb. K. K. Acad. Wiss. lxii, p. 329.

Uromastix fasciatus, Mén. Cat. Rais. p. 64.

Gymnodactylus geckoides, Gray, Cat. Liz. Brit. Mus. p. 175, partim.—Blyth, J. A. S. B. 1853, xxii, p. 410.—Theobald, J. A. S. B. 1868; Cat. Rept. Mus. As. Soc. Bengal, p. 31.

Duméril and Steindachner have shown that *Gymnodactylus Caspius* is distinguished from *G. geckoides*, Spix, amongst other characters, by the number of femoral and præanal pores; about thirty in the former species, extending in a line along both thighs; only four to eight in the latter, confined to the inguinal region. Steindachner (Sitz. Acad. Wien, lxii, 1870, p. 329) has farther separated from the African *G. geckoides* (*G. scaber*, Rüpp.), under the name of *G. Kotschyi*, the race with much smaller dorsal tubercles inhabiting Syria and the neighbouring countries, and agreeing with the African species, not with *G. Caspius*, in the number of præanal pores. A fourth form is *G. Kachhensis*, Stoliczka, from the province of Kachh, in Western India, 'Proc. As. Soc. Bengal,' 1872, p. 81.

I did not meet with *G. Caspius* in Persia; but it is probable that it is not rare in some of the northern provinces. It may very possibly be found in Khorassán and Afghánistán, as specimens were collected by Theobald in the Panjáb. The specimens obtained by the Marquis

Doria at Hamadán, and referred to this species by De Filippi, are clearly distinct, and belong to the last species.

25. *G. geckoides, Spix.

Gray, Cat. Liz. Brit. Mus. p. 175.
G. scaber, Rüpp. Atlas, p. 15, Pl. IV, fig. 2.

A specimen obtained by Kotschy at Shiráz exists in the British Museum, which received it from the Museum at Vienna. I am indebted to Mr. O'Shaughnessy for calling my attention to it.

Specimens of the same species are said also to have been brought from Persia by Aucher-Eloy.

Bunopus[1], gen. nov.

W. Blanf. Ann. and Mag. Nat. Hist. June 1874, xiii, p. 454.

Genus inter Gymnodactylum et Stenodactylum fere medium, cum illo digitis ad latera haud denticulato-fimbriatis, cum hoc scutellis infra-digitalibus verrucosis concordat.

Toes slender, not fringed at the sides, covered below by cross plates, which are furnished with projecting tubercles (Pl. XXII, fig. 4 a). General form as in *Gymnodactylus*.

This form only differs from *Stenodactylus* in the absence of fringes to the toes; but this distinction is important, since the presence of fringes is characteristic of lizards which dig holes and usually live in them[2].

26. Bunopus tuberculatus, W. Blanf. Pl. XXII, fig. 4, 4 a, 4 b.

Ann. and Mag. Nat. Hist. l. c.

1.	Samán, Dasht, Balúchistán	—
2–7.	Báhú Kalát, Balúchistán	—
8–23.	Píshín, Balúchistán	500
24–27.	Mand, Balúchistán	700
28.	Isfandak, Balúchistán	3200
29.	Near Bampúr, Balúchistán	1500
30.	Rígán, Narmashír, south-eastern Persia	2500
31.	Túmb Island, Persian Gulf	—

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[1] Etym., *βουνός*, a mound, and *πούς*, a foot.

[2] Conf. C. Duméril, Rev. Zool. 1851, p. 479.

B. *griseus, fusco-maculatus atque transfasciatus; tuberculis dorsalibus confertis triquetris, meatum auditorium magnitudine fere æquantibus, ornatus; porisque inguinalibus circa* 7 *præditus; scutellis post et inter nares vix majoribus, supralabialibus* 10–12; *caudâ annulatâ, annulis tuberculatis.*

Hab. in Gedrosiâ (Balúchistán) Persiâque meridionali frequens.

General form moderately depressed; the head higher and broader in proportion to its length in adult specimens than in young ones. Back granular, with numerous enlarged tubercles in about fourteen longitudinal rows (not very regular), larger and as a rule trihedral on the centre of the back and base of the tail, where they are often nearly as large as the ear-opening, smaller and convex on the back of the neck and on the sides. The larger trihedral tubercles are nearly as broad as long.

Pupil vertical. Nostrils between the rostral, first labial and three small shields behind, the latter being scarcely larger than the granular scales covering the muzzle. Rostral about as broad as it is high, grooved above; mental rather broad. Upper labials about ten to twelve; lower labials eight to ten. No enlarged chin shields behind the labials; ear-opening small. Chin and throat covered with small granular scales. Abdomen covered with flat hexagonal subimbricate scales in about twenty-five to thirty rows across the middle. A row of præanal pores between the thighs nearly in a straight line, usually seven in number, sometimes six or eight (Pl. XXII, fig. 4 b). Tail, when perfect, longer than the head and body, verticillate, each ring being terminated by a row of large closely-set carinate scales, wanting below and in the centre above; no enlarged subcaudals.

Limbs moderate, granular above with scattered enlarged tubercles, the granular scales larger and flatter below, on the thighs especially. Toes and fingers rounded, rather short, covered with small imbricate scales above.

Colour sandy, with dark spots taking more or less the form of cross-bands on the back and tail. Dark marks from the nostrils on each side through the eyes, sometimes meeting each other on the occiput. Some specimens are much darker than others, and marked with brown transverse bands throughout.

A variety of which I have specimens from Mand, Báhú Kalát, and Samán, in Balúchistán, differs so much in colour from the common form of the species that I was at first inclined to consider it distinct.

The ground colour is pale sandy, with the dark markings on the back almost confined to the enlarged tubercles, some of which, in patches, are brown, the patches having a tendency to form longitudinal rows. There is a dark mark from the nostril through the eye to above the shoulder; farther back it becomes broken up. The dorsal tubercles too in this form are small, and sometimes less distinctly trihedral. There appears, however, to be no constant distinction between the two varieties, which occur together.

B. tuberculatus abounds in parts of Balúchistán, being found in houses and under stones on hill-sides, etc. I never obtained it at more than about 3000 feet of elevation above the sea. In Pl. XXII, fig. 4 a, the terminal portion of a toe, much magnified, is shown from beneath; fig. 4 b represents the pores of the inguinal region.

27. **Pristurus rupestris**, W. Blanf. Pl. XXIII, fig. 1, 1 a.

Ann. and Mag. Nat. Hist. June 1874, xiii, p. 454.
1–3. Near Maskat, Arabia.
4–6. Khárg or Karrack Island, Persian Gulf.

P. *parvus, dorso squamis æqualibus induto, sine cristá; caudá compressá, supra, haud infra, cristatá; pupillá rotundá. A* P. flavipunctato, *Rüpp., differt dorso non cristato, cruribus longioribus, scutis infralabialibus plerumque* 3, *nec* 5.

Hab. in rupibus ad Maskat Arabiæ et in insulá Kharg vel Karrack dictá, in Sinu Persico.

Scales of the back and sides and of the upper part of head and limbs equal, not imbricate, round, convex. *Back not crested.* Tail *compressed laterally, indistinctly verticillate, with a low crest* of flat spines, their points directed a little backward, along the top; *none below.* Scales of the sides of the tail equal, granular; those below rather larger and flatter. Scales of abdomen round, flat, but little larger than those on the back, and passing so gradually into the convex scales of the sides that it is difficult to estimate the number. No femoral or præanal pores.

Pupil round. Upper eyelid but slightly developed; no lower eyelid. Nostril directed laterally upwards between the rostral and about three scales, two of which, one on each side of the nostril, are enlarged, the outer of these separating the nostril from the first labial; the other enlarged scale does not meet the corresponding one on the opposite side of the rostral. Rostral large, cleft above. Mental larger and broader than the rostral. Six upper and three lower labials; no enlarged chin shields behind the labials.

Limbs rather elongate, the fore-limb laid forward reaches the end of the nose, and laid back extends to the thigh; the hind-limb laid forward comes nearly or quite to the ear; toes 5–5, slender, rounded, with minute claws. The scales above the limbs similar to those on the back, those on the inner anterior side of the thigh and below the tarsus larger and flat, those above the toes imbricate; beneath the toes are cross-plates, as in *Gymnodactylus*, scarcely so broad as the toes, the plates beneath the joints of the toes being longer, but not broader than the others.

Colour (noted when fresh) olive grey, a pale band down the centre of the back, the back and sides with rufous spots forming broken longitudinal lines, those on the back larger than those on the sides and with a white hinder margin; these spots disappear in spirits. A rather narrow dark mark from the nostril to the eye, continued a short distance behind the latter. Specimens from Khárg are spotted black on the sides of the head and neck, chin, and throat, but Maskat examples are unspotted.

The length of the only perfect specimen I have is 1.9 in., of which the tail from the anus measures 1.05, and the head and body 0.85; the hind-limb 0.55, and the fore-limb 0.35. Other specimens are a little larger, the length from the nose to the anus in the largest specimen being a little over an inch, but the species would appear never much to exceed two and a half inches in length.

This is evidently a second species of Rüppell's genus *Pristurus*, and very closely allied to *P. flavipunctatus*, Rüpp. (Neue Wirbelth. Rept. p. 17, Pl. VI, fig. 3), but that species is distinguished by having the posterior portion of the back crested as well as the tail, by its stouter habit and shorter limbs. In specimens of *P. flavipunctatus* in the British Museum the hind-legs just reach the shoulder, whereas in *P. rupestris* they come in front of it when laid forward, and, in the former, the fore-legs do not extend to the thigh when laid backward, which they do in the latter. Other differences are that in *P. flavipunctatus* the tail is more compressed, and that there are seven upper and five lower labials on each side, the usual corresponding number in *P. rupestris* being six and three. According to its discoverer also, the habitat of *P. flavipunctatus* differs essentially from that of *P. rupestris*, for Rüppell found the former on trees. It was discovered near Massowa, on the coastland of Abyssinia.

Messrs. Duméril and Bibron unite *Pristurus* to *Gymnodactylus*, but Dr. Gray, in his 'Catalogue of the Specimens of Lizards in the British Museum,' classes it as distinct, and I quite agree with this view. The genus is distinguished not only by its compressed tail and caudal crest, but by its being diurnal and having a circular pupil.

I obtained specimens first near Maskat, in Arabia, on limestone rocks and in houses at a place called, I think, Fálej, four or five miles inland. The majority of these had dried and become useless before I could put them in spirits, and in none was the tail preserved, but I had noted down their characters when fresh. I subsequently obtained some more specimens, which only differ in colouration, on the island of Khárg or Karrack, north-west of Bushire, in the Persian Gulf, again upon limestone rocks. These geckoes appeared to be quite diurnal; I found them out on the surface of the rocks at 10 or 11 o'clock in the morning, and they only took refuge in the crevices when approached. Owing to the numerous cracks and fissures in the limestone, it was difficult to capture specimens, for these little geckoes were very active.

Ceramodactylus[1], gen. nov.

W. Blanf. Ann. and Mag. Nat. Hist. June 1874, xiii, p. 454.

Digiti ad latera fimbriati, subtus squamis parvis imbricatis in seriebus obliquis ordinatis obtecti; caput corpusque squamis parvulis undique induta; crura longiuscula; palpebra inferior nulla.

The toes fringed at the sides and covered beneath with minute pointed scales, distinctly imbricate. In the only species known the edges of these scales are denticulate (Pl. XXIII, fig. 2 a). General form rather agamoid; head large, not depressed; both the head and body covered with very small subequal scales above and below; legs rather long.

This genus is near *Stenodactylus*, but differs from it in having imbricate scales in oblique series instead of cross-plates beneath the toes. A similar arrangement is represented by Duméril in the figure which he gives of the toe of the remarkable West African form named by

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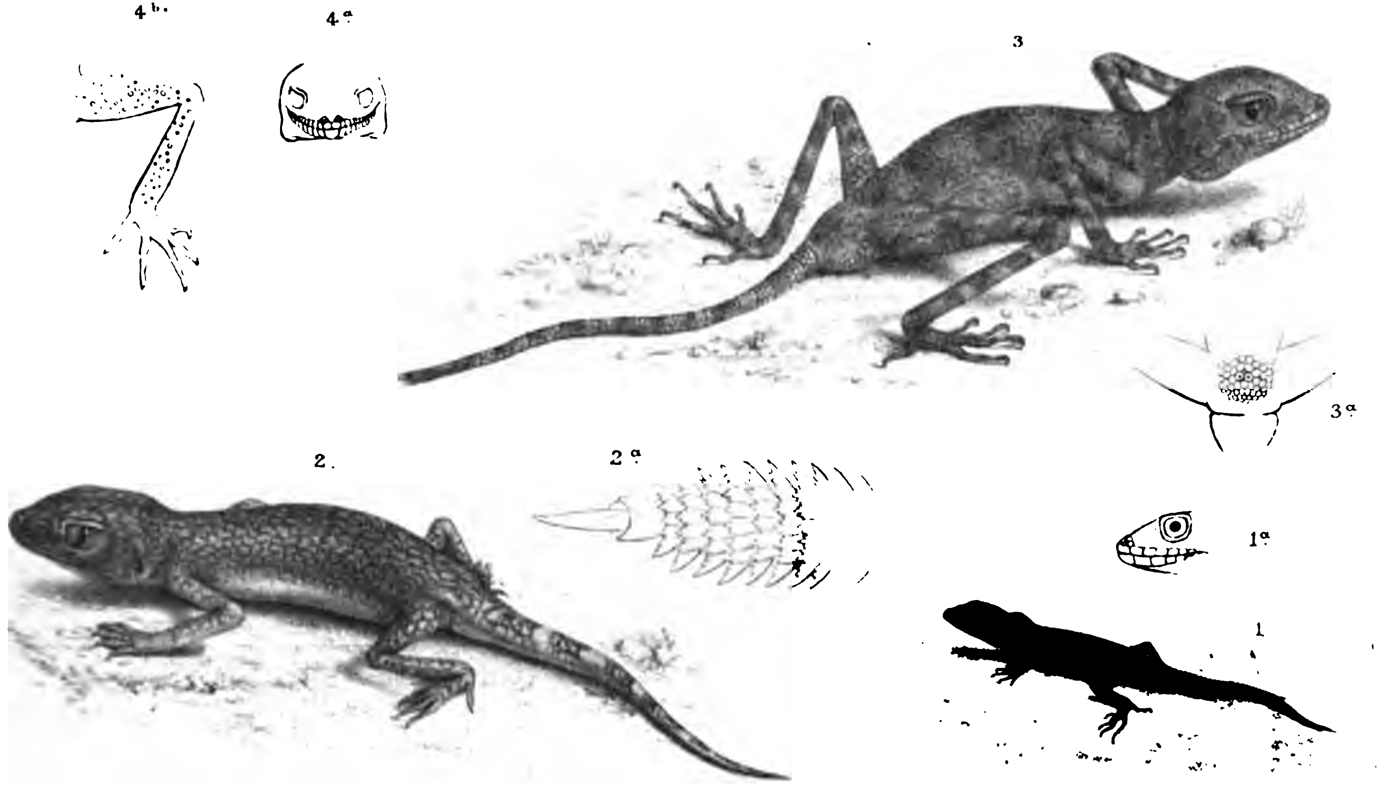
[1] Etym. *κέραμος*, a tile, and *δάκτυλος*, a finger.

Pl XXIII.
Zoology of Persia



G. H. Ford lith. Mintern Bros. imp.

1. PRISTURUS RUPESTRIS. 2. CERAMODACTYLUS DORIÆ.
3. AGAMURA CRURALIS. 4. A. PERSICA.

him *Stenodactylus caudicinctus* (Arch. du Mus. viii, Pl. XVIII, fig. 15), but the scales are much fewer in number. This species Dr. Gray (P. Z. S. 1864, p. 60) proposed to make the type of a new genus under the name of *Psilodactylus*, which he considered (rightly, I believe) allied to *Eublepharus*. It differs widely, in my opinion, from *Ceramodactylus Doriæ*, being distinguished by its heavy body, massive ringed tail, and very marked and peculiar dorsal tuberculation, and I think that Dr. Gray was quite justified in placing it in a genus by itself.

The toes of *Stenodactylus garrulus* (Smith), (*Ptenopus maculatus*, Gray) are broader than those of *S. guttatus*, and besides the cross-plates with projecting points, which occupy the central portion of their lower surface, there are granules towards the margin. Still there is no such important difference from *S. guttatus* in the scales covering the lower surface of the toes as there is in the present genus.

28. * **Ceramodactylus Doriæ**, W. Blanf. Pl. XXIII, fig. 2, 2 a.—De F.

Ann. and Mag. Nat. Hist. June 1874, l. c.
Stenodactylus guttatus, De F. Viag. in Pers. p. 352, nec Cuv.

C. *squamis capitis, corporis atque caudæ omnibus, supra subtusque, parvis, fere æqualibus; caudâ quam corpore breviore; capite magno, parum depresso; oculis magnis, pupillâ verticali, meatu auditorio parvo; pede anteriore femur fere attingente, posteriore axillam; poris inguinalibus duobus distantibus; superne fulvus, albo confertim maculatus.*

Hab. haud procul a Bandar Abbas juxta litus Sinus Persici.

The surface of the head, body, and tail, both above and below, is covered with small subequal, slightly convex scales, those of the throat being scarcely smaller than those of the belly, and the latter about equal to those of the back. The back scales are in oblique rows. There are no enlarged præanal or subcaudal scales, but there are two scales, one on each side, in the inguinal region just between the thighs, rather larger than the others, and each perforated by a pore. These two scales are separated from each other by about six ordinary scales. The tail is not verticillate, it is very slightly depressed at the base only, regularly attenuate and shorter than the head and body.

The body is rounded, not depressed; the head large, much broader than the neck[1]; the limbs long; the fore-foot laid forward extends beyond the snout by the whole foot, laid back it nearly touches the thigh; the hind-foot laid forward reaches the shoulder. The length of the only specimen examined is 4.5 in., of which the tail from the anus measures 2, head 0.8, fore-leg to end of toes 1.15, longest toe (third) 0.18, hind-leg 1.35, longest toe 0.25.

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[1] The specimen appears to have slightly shrunk in spirits, and the head in a fresh specimen may differ less in size from the neck and body.

The toes are of moderate length, fringed at the sides like those of an *Acanthodactylus*, rather broad, and covered beneath with peculiar imbricate scales, so small that a microscope is required to make them out. These scales are in cross rows close to the ends of the toes, but only in oblique series elsewhere; they are sharply pointed at the end, and their free margins bear one or two smaller points on each side. The claws are well developed (Pl. XXIII, fig 2 a, showing the extremity of a toe seen from beneath and greatly magnified).

The eyes are large, with a well-developed upper eyelid covered with small granular scales; no trace of a lower eyelid; the pupil appears to be vertical. Ear-opening small. Nostrils surrounded by the rostral, first labial, and three postnasal shields, which appear a little swollen in the specimen, but this appearance may be due to the shrinking of the head. The rostral is divided vertically into two. Supralabials about twelve to fourteen, those behind very small; lower labials about fourteen. Mental shield quadrangular, rather larger than broad; no enlarged plates behind it.

Colour, in spirits, pale brown, thickly spotted with white, much as in *Stenodactylus guttatus*.

The only known specimen of this species was obtained by the Marquis Giacomo Doria, who has informed me that he found it on the sand of a torrent bed, one march from Bandar Abbás on the road to Karmán. It is the specimen to which De Filippi refers under the name of *Stenodactylus guttatus*. It belongs to the museum of Turin, and I am indebted to the courtesy of Count Salvadori for the loan of this and of specimens of *Gymnodactylus heterocercus* and *Lacerta Brandti*.

29. ***Teratoscincus Keyserlingi**, Strauch.

Strauch, Bull. Acad. Sci. St. Pet. 1863, vi, p. 480.—Zool. Record, 1864, p. 111. —Mel. Biol. vi, p. 554.

This was one of two species brought by Count Keyserling from Khorassán, and described by Strauch, who at first referred the form to the scinques, on account of the granular surface of the tongue, but subsequently ascertained that it was a gecko near *Stenodactylus*. It is in all probability still more closely allied to the remarkable form from Western India, *Teratolepis fasciata* (Blyth), (Günther, P. Z. S. 1869, p. 504), from which it differs in having an external ear, the toes not dilated, but fringed at the sides, the tail longer, and the scales of the back not carinate. It is perhaps a question whether the two genera might not be united, but a comparison of specimens would be necessary.

Teratoscincus is a rather large gecko, about six inches long, covered with smooth imbricate scales. The head is gecko-like, the pupil of the eye circular. The feet are like those of *Stenodactylus*, the margins being fringed as in *S. garrulus*. It was obtained at a place called Seri-Tschah (probably Sar-i-cháh, head of a spring, or spring-head), and most likely from a spot so named marked on Khanikoff's map about 150 miles W. by N. of Lásh Jowain, and a similar distance N.N.E. of Karmán.

Agamura, gen. nov.

W. Blanf. Ann. and Mag. Nat. Hist. June 1874, xiii, p. 455.

Genus Geckotidarum propter squamas digitosque ad Gymnodactylum *accedens, dorso tuberculato, palpebris inferioribus nullis, pupillá verticali, dentibus numerosis æqualibusque, linguá antice brevissime fissa; sed membris elongatis, caudá subcylindricá, valde flexibili, nunquam regenitá,* Agamæ *simile.*

This new genus is proposed for the very singular gecko described by C. Duméril as *Gymnodactylus Persicus*, and for another closely allied species which I obtained in Balúchistán. These two appear to form, with *Spatalura Carteri*, Gray, and perhaps *Pristurus longipes*, Peters, a group which may almost be considered as a sub-family of the *Geckotidæ* with Agamoid affinities, which are, however, perhaps more superficial than real. The characters of the skin, tongue, teeth, and eyes are those of ordinary geckoes, but the elongate limbs and the very peculiar flexible tail differ widely from the corresponding parts in other genera of the family; not a single specimen of *Agamura* which I have examined shows signs of the tail having been reproduced, whilst in ordinary geckoes nearly one-half have lost their tails and formed new ones. The caudal vertebræ, however, are biconcave as in the other geckoes, not concavo-convex as in the Agamoids, and they differ principally from those in the more typical forms, such as *Hemidactylus*, in their very short apophyses, the transverse processes in especial being very little developed, as might be expected from the tail being round instead of depressed.

The nearest ally of *Agamura*, so far as I know, is a form obtained by Dr. Carter on the island of Massira, off the south coast of Arabia. This was described by Dr. Gray (P. Z. S. 1863, p. 236), under the name of *Spatalura Carteri*. It is distinguished from *Agamura* by having a compressed tail, fringed above and below, and it also differs from both the known forms of the new genus by its non-tuberculate back, much fewer labials, and much larger ear orifice.

30. **Agamura cruralis**, W. Blanf. Pl. XXIII, fig. 3, 3 a.

Ann. and Mag. Nat. Hist. l. c.

1. Rás Malán, about 120 miles west of Karáchí, Balúchistán.
2-4. Báhú Kalát, Balúchistán.
5, 6. Mand, Balúchistán.
7, 8. Zamrán, Nihing River, Balúchistán.
9, 10. Askán, near Bampusht, Balúchistán.

A. *grisea, fusco transversim fasciata; dorso granulato, granulis vix convexis tuberculisque majoribus frequentibus instructo; membris elongatis, pede posteriore oculum attingente, haud tuberculatis, nisi interdum supra femur; capite brevi, alto; supralabialibus utrinque* 12–14; *meatu auditorio mediocri, caudá verticillatá, inermi, subtus serie unicá scutorum polygonalium majorum instructá. Poris inguinalibus in maribus duobus.*

Hab. inter lapides in Balúchistán.

Scales of the back rather flat, more or less round and somewhat unequal in size, with rather numerous and larger scattered convex tubercles, not in distinct rows, but nearly equidistant from each other. Scales of sides granular, subequal, smaller than those of the back; those of the belly rounded, subimbricate, about the same size as those on the back, passing gradually at the sides into the smaller scales. Head covered with rounded scales above, those on the occiput smaller than those on the snout, and having sometimes a few scattered larger tubercles; eye large, pupil vertical[1]; upper eyelid well developed, with a row of larger scales along the margin; lower eyelid wanting. Nostrils directed rather upward, between the rostral, first upper labial and three scales, a little larger than the ordinary scales on the snout, behind. Rostral nearly twice as broad as high, grooved in the centre above; upper labials 12–14, lower 9–11 on each side, both becoming much smaller behind and often varying in number on the two sides of the same animal. Mental shield elongate; no enlarged chin shields behind the labials; chin and throat covered with rounded granular scales, very little smaller than the ventrals, and some of which along the edges of the lower labials are larger than the others. Ear-opening moderate, about as large as one of the anterior upper labials.

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[1] In many specimens preserved in spirits the pupil is fully expanded and appears circular.

Limbs covered above and below with nearly equal subimbricate scales, about the same size as those of the back; occasionally there are a few convex enlarged tubercles on the upper part of the thigh, but not on the tarsus; the scales behind the thigh smaller and granular. The soles of all the feet are covered with convex tubercles of unequal size, some being much larger than others. The toes are rounded, not fringed at the sides, and covered with small imbricate scales above, and with cross-plates below. All the toes are furnished with minute claws. The hind-foot laid forward reaches the eye, the fore-limb laid backward extends beyond the thigh, often reaching the vent.

There are two inguinal pores in enlarged adjacent scales between the thighs some distance in front of the vent, in the males (Pl. XXIII, fig. 3 a); the females have the enlarged scales, but not the pores.

Tail thick at the extreme base, but becoming suddenly small just behind, and continuing of nearly the same thickness to the end. Its length is rather less than that of the body and head together. It is covered above and at the sides with smooth subimbricate scales, rather longer than broad, arranged in rings, every fourth ring consisting of rather larger scales in some specimens, though not in others, and the verticils thus formed are never so well marked as in the next species. Beneath the tail is a single row of larger polygonal plates, equally long and broad, each corresponding to two rings of scales; these are often broken up into smaller scales near the base of the tail.

Total length of a large specimen measured when fresh 5.75 in., of which the tail from the vent measured 2.4, head 0.8, fore-limb 1.43, third toe of fore-foot 0.27, hind-limb 1.9, its middle toe 0.32.

The teeth are obtuse, subcylindrical, numerous, and closely set in both jaws throughout; no larger teeth in front of either jaw; the tongue broad and fleshy, very briefly cleft at the end.

Colour grey, with broad transverse dusky bands on the upper parts of the body, tail, and limbs, and with more or less dusky irregular spots on the upper parts, chin, and throat. There is usually a dark cross-band on the back of the neck, and four others, sometimes five, across the back.

The first of these peculiar geckoes which I met with I found in the middle of the day on the open, barren, stony plain which forms the flat top, 2000 feet above the sea, of the promontory known as Rás Malán. I at first took it for an Agamoid lizard, and it was only on carefully examining it subsequently that I saw it was a gecko. I afterwards found several specimens in barren stony plains and on hill-sides, usually in the evening, and from the vertical pupil I should judge this species to be usually nocturnal. I met with it here and there up to an elevation of about 3000 feet above the sea, but not higher: it was never common, and I found no specimens about houses.

Its mode of progression is by no means fast, and somewhat resembles that of a chamæleon, although it is not so slow. It is usually easily captured, although on level ground it can run quickly for a short distance, but its motions have but little of the usual activity of geckoes. I never saw it climb up a perpendicular surface, and from the formation of its feet I doubt if it can do so, except by clinging with its claws as the Agamoid lizards do.

31. A. Persica (C. Dum.), Pl. XXIII, fig. 4 a, 4 b.

Gymnodactylus Persicus, C. Duméril, Archives du musée d'Hist. Nat. viii, p. 481.

1–2. Ráyín, south-east of Karmán	8000
3. ? near Isfahán[1]	(?)

I find on comparison with the types in the Paris Museum of Natural History that my specimens correspond with those described by Duméril. It is unnecessary to give a detailed description of this form, which closely corresponds in all its principal characters with *A. cruralis*, but is distinguished by having rather shorter limbs, the hind-foot when laid forward only reaching the ear, the fore-foot only just extending to the thigh; by having the ear orifice rather smaller, and the tubercles on the back, and especially on the occiput, larger and more numerous. There are no inguinal pores in any of the specimens examined, but all have the scales between the thighs slightly enlarged. The most characteristic differences, however, are, that in the present species the upper parts of the thigh and tarsus are ornamented with enlarged convex tubercles (Pl. XXIII, fig. 4 b) that the tubercles on the posterior portion of the back are conoidal with points directed backward, and the rostral shield is vertically divided into two (fig. 4 a) instead of being merely cleft above. In general form, colouration, and habits, *A. Persica* resembles *A. cruralis*, but it is found at a much greater height above the sea. The specimens procured near Ráyín were taken on the stony lower slopes of the Kúh-i-hazár, at an elevation of at least 8000 feet.

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[1] The label of this specimen was illegible. It was obtained from some place on the road from Karmán to Isfahán *viâ* Shiráz, and I think I remember finding it not far from Isfahán.

This species was originally described by C. Duméril, from specimens collected by M. Aucher-Eloy. As has been already pointed out, these specimens, although all labelled Persia, appear in part to have been procured in countries lying to the westward, and the exact localities not having been recorded, it is impossible now to identify them.

FAMILY CHAMÆLEONTIDÆ.

A specimen of *Chamæleon vulgaris*, brought by Aucher-Eloy from his Persian journey, exists in the Paris Museum. It belongs to the western or African form, and not to the Indian (*C. Ceylonicus*, Laur.)

As with most of Aucher-Eloy's collections, the exact locality of the specimen remains doubtful, but it is highly probable that the chamæleon inhabits the forests on the flanks of the Zagros mountains and those of Mazandarán. Without more certain information, however, I cannot say positively if it is found in Persia or not.

FAMILY VARANIDÆ.

32. *Psammosaurus Caspius, Eichwald (?=*P. scincus* [Merr.]).—De. F.

Eichwald, Zool. Spec. iii, p. 190. — Fauna Casp.-Cauc. p. 48, Pl. VII, VIII, IX. (The Plates represent the osteology only.)

Varanus arenarius, Geof. De F. Viag. in Persia, p. 352.

I did not obtain this species, and I have not access to specimens sufficient to determine whether it is really distinct from *P. scincus* (Merrem). There is a very fine stuffed specimen of *P. Caspius* in the British Museum which appears to agree well with African examples of *P. scincus*, and as the species found in North-western India (*Varanus ornatus*, Carlleyle) has been identified with *P. scincus* by several naturalists, I think it very possible that *P. Caspius* may be the same lizard.

The distinctions pointed out by Eichwald are chiefly the shape of the tail, which he says is round throughout in *P. scincus* (*P. griseus* is the name under which he refers to it), whilst, except at the base, it is somewhat compressed in *P. Caspius*, and the teeth are said to be minutely serrated at the edge in the former, but not in the latter. But in specimens of *P. scincus* preserved in spirit in the British Museum the tail is slightly compressed behind, and the serration on the sides of the teeth does not appear to be a very well marked character. Eichwald also notices some differences in the form of some of the bones.

Eichwald states that this reptile extends to Persia, and De Filippi obtained a specimen from the neighbourhood of Tehrán, which is now in the Turin Museum.

33. **Varanus dracæna** (L.)

Günther, Rept. Brit. Ind. p. 65.

1. Píshín, Balúchistán.

Only a single specimen was obtained in Balúchistán, and no monitors were seen on the Persian plateau. The specimen procured was olive-grey when alive, with imperfect whitish transverse bands on the posterior portion of the body and the tail. The lower parts are much paler, with dusky spots on the throat. The length when fresh was 36 in.[1], of which the tail from the vent measured 21 in. There are 107 rows of ventral shields from the gular fold to the groin, the first 25 being irregular, the remainder in regular transverse rows; the whole number is considerably more than that given by Günther, but specimens from the west have perhaps more numerous ventral shields than those from other parts of India. Stoliczka gives the number in specimens from Kachh as 90 to 100.

Varanus dracæna, so far as my observations extend, is a thoroughly terrestrial lizard, living in dry places far from water. The same has been noted by Carlleyle (J. A. S. B. xxxviii, 1869, p. 195) and Stoliczka (P. A. S. B. 1872, p. 73), and is also said by Carlleyle to be the case with *V. lunatus*, which indeed appears to be little more than a variety of *V. dracæna*. I found the Abyssinian *V. ocellatus* living similarly far from water. The specimen of *V. dracæna* from Balúchistán was obtained in a very dry region, where the only water occurs in small streams, which are dry, except in a few pools, for the greater part of the year.

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[1] It has scarcely altered by preservation in spirits.

FAMILY LACERTIDÆ.

34. **Lacerta muralis**, Merr.—De F.

L. agilis, Men. Cat. Rais. p. 60, teste Eichwald.

1-55. Elburz mountains, north of Tehrán .. 5000-10000

Some of the specimens collected want the usual large mid-temporal shield. Duméril and Bibron speak of this character as variable, but in some specimens I find it entirely wanting, the whole temporal region being occupied by subequal scales. The fore-legs, too, when laid forward do not reach the nostril, as they are said to do in European specimens; usually the ends of the toes just touch the eye. The præfrontal is occasionally divided, and sometimes there is a small shield between the postfrontals.

The colouration (noted from fresh specimens) agrees best with that of variety *d.* of Duméril and Bibron. It is olive-grey on the back, finely spotted with black, rather darker on the sides, the under parts pale throughout in some individuals, in others (probably males) all the abdomen, breast, throat, and sometimes part of the lower labials, are brick-red, and when this colour is most intense there is a line of pale blue spots on the exterior edges of the outermost ventral scales. This colour is very possibly only assumed in the breeding season (my specimens were collected in August). Behind the eye is a broad dark band.

L. muralis inhabits the higher parts of the Elburz mountains. I only saw it on the south side of the hills, close to their summit, but it abounded on the north side, in the forest region, as low as 5000 feet above the sea, and perhaps lower, and was met with, rather less abundantly, up to an elevation of at least 10000 feet. De Filippi met with this lizard in the same neighbourhood, in the valley of the Lár, north-west of Tehrán, at a considerable elevation. I did not observe it elsewhere in Persia.

L. Taurica was found by De Filippi common in Armenia and the Caucasus, but not further to the East. It does not appear as yet to have been found in Persia. Dr. Gray (Cat. Liz. Brit. Mus. p. 28) identifies the *L. agilis* of Ménétries with *L. Taurica*, but Ménétries himself calls his species *Le lézard des murailles* of Daudin, and *L. muralis*, common throughout the Elburz, is probably equally abundant on the Tálish mountains, Ménétries's locality.

35. ***Lacerta Brandti**, De F. Pl. XXV, fig. 1.

De F. Archiv. p. la Zool. ii, p. 387; Viag. in Persia, p. 354.

This species, according to De Filippi, may be distinguished from its allies by the number of the series of abdominal shields. The specimens obtained were captured at Basminsk, the first halting-place from Tabriz on the road to Tehrán.

I have examined the types, two in number, in the Turin Museum, and by the kindness of Count Salvadori, the Curator of the Museum, I have been allowed to bring one of them to England for comparison. From it I take the following detailed description of the species.

Description :—Palatal teeth present. Lower eyelid opaque, granular. Two postnasals. Temples covered with small polygonal scales, irregular in size, with one or two larger scales in the centre. Ear-opening moderate, not toothed in front, with one larger plate in front above. Dorsal scales small, round, convex, equal, arranged in transverse and oblique series; I count fifty-two to fifty-three scales round the body, not including the ventral plates. Scales of the throat about equal in size to those on the back; those of the collar variable in number (seven in one specimen, ten in the other), decidedly larger than those immediately in front; the collar is straight, free, the edge even, not denticulated. Ventral scales in twenty-nine to thirty-one transverse rows and eight longitudinal rows, all nearly equal in size: in one of the specimens there is an additional row of much smaller scales on each side, but it is broken up in the other specimen. A large præanal plate. Femoral pores sixteen to nineteen; the thighs protected below by large transverse plates; scales beneath the feet convex;

toes a little compressed. Tail scales oblong, very narrow, obliquely carinate above, smooth below, arranged in rather short verticils.

Habit moderately slender, rather stouter than in *L. muralis*. The fore-limb laid forward reaches to the nostril; the hind-limb nearly or quite to the axil. The tail is wanting or renewed in both specimens; in that before me the length from the nose to the anus measures 2.65 in., the head to the posterior margin of the occipital plates 0.55, fore-limb 0.9, hind-limb 1.35.

Colour:—Centre of back olive grey; a rather irregular whitish line down each side, breaking up behind into white spots, with irregular mottling and spots of black forming an indistinct band inside and outside the white one; another ill-marked pale line down the lower portion of each side, the ground colour of which, and of the breast and abdomen, is pale greenish blue (glaucous green), the anterior and inner margins of most of the ventral plates near the sides being black. According to De Filippi, there are some blue spots near the axillary region, and the anal region and lower part of the tail are tinged with fiery red; but these colours have faded in spirits. The limbs are bluish-grey above, with pale spots, and there are a few black marks on the tail and the sides of the head. This, it should be remembered, is the colouration of a specimen which has been for some years in spirits; living animals are probably more brightly coloured.

Head shields:—Rostral moderate, broader than high; the anterior nasals meeting in a short suture behind it. Posterior nasals two, equal in size, one above the other. Anterior loreal about as high as broad and half the length of the posterior loreal or præocular. *Canthus rostralis* rounded. Præfrontal rather broader than long, more angulate in front than behind; postfrontals each nearly equal in size to the præfrontal, as long as broad, irregularly pentagonal, meeting in a very long suture in front of the vertical. The vertical is nearly as broad behind as in front; anterior margin convex, posterior with a projecting point in the middle; lateral margins very little concave. Superciliaries four in number, a very small one in front, followed by two large shields, the anterior the larger, and both separated by a row of granules from the superciliary ridge; another small superciliary, larger than the foremost one, behind. Anterior occipitals irregularly pentagonal, together scarcely equal to a post-occipital in size. The latter are much longer than broad, and narrower in front than behind. They are separated from each other by a small elongate central occipital, and a still smaller interoccipital behind it, and are bounded on the outer margins by some rather long shields. Supralabials nine on each side, the sixth being the large infraorbital shield; lower labials six or seven; chin shields in five pairs all touching the lower labials; the first three pairs in contact with each other, and the fourth pair a little the largest.

This form does not appear to have been refound by any one since its first discovery by De Filippi; neither Major St. John nor I met with it during our travels in Persia.

36. *L. viridis, L.

According to Eichwald, a variety of this lizard is found on the shore of the Caspian, near Astrabád. (Fauna Casp.-Cauc. p. 66.) It is also met with in the Caucasus. Pallas states that his *Lacerta Europæa, β. viridis*, which I believe is the same, is common in Persia (the Caspian provinces ?) in grassy fields. (Zoog. Ros. As. iii, p. 29.)

37. Lacerta strigata, Eichwald.—De F.

Eichwald, Zool. Spec. iii, p. 189.—Fauna Casp.-Cauc. p. 70, Pl. X, fig. 4, 5, 6. —Gray, Cat. Liz. Brit. Mus. p. 32.—Anderson, P. Z. S. 1872, p. 372.

L. viridis, var. Dum et. Bibr. Erp. Gén. v, p. 212.

L. viridis, var. *strigata*, De F. Viag. in Persia, p. 354.

Two specimens of this lizard, obtained by Major St. John at Shiráz, have been described by Dr. Anderson (l. c.), who has, however, omitted to state by whom the specimens were obtained. De Filippi met with the same species at Lankorán, and the specimens collected by him are in the Turin Museum.

This may perhaps be only a small form of *L. viridis;* but although it appears closely to resemble that species in all important characters, it looks so different from the common green lizard of Southern Europe that I should hesitate to unite them. De Filippi says of *L. viridis*, var. *strigata:* 'A constant race, very nearly ranking as a true species.'

38. L. princeps, W. Blanf. Pl. XXIV.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 31.

1. Hills near Niriz, east of Shiráz, South Persia .. 7000

L. *magna, fere sesquipedalis, dentibus palatalibus prædita; scutis postnasalibus utrinque binis; præfrontali unico; verticalis marginibus lateralibus parallelis, anteriore posterioreque in medio prominentibus; squamis temporalibus polygonalibus, anticè majoribus; collare libero, denticulato; squamis dorsalibus rhomboideis, carinatis, in series transversas ordinatis; ventralibus in decem series longitudinales, extremas valde angustiores; poris femoralibus utrinque* 14; *supra griseo-olivacea, subtus albida, maculis* 4–5 *cæruleis, nigro marginatis, longitudinaliter ordinatis, post axillam utrinque ornata.*

Hab. in Persiá meridionali.

Description:—Palatal teeth present. Nostrils in the lower posterior angle of the nasal shield followed by two postnasals. Lower eyelid opaque, scaly. Temples covered with polygonal shields, large in front, small behind. Scales of the neck above and at the sides granular, passing gradually on the shoulders into the subimbricate, equal, rhomboidal, diagonally carinate scales of the back. Scales of the sides rather smaller than those of the back, and not keeled. Scales of the sides and back in transverse rows of about thirty-four each. Scales of the throat imbricate behind, about the same size as those of the back; collar well marked, with a denticulated edge, formed by the projecting points of seven enlarged imbricate plates. Ventral scales in thirty-one transverse, and, in the middle of the belly, ten longitudinal rows, the outer longitudinal row much smaller than the others, and the two central rows rather narrower than the rest. Præanal plate slightly larger than the others; fourteen femoral pores on each thigh. Limbs covered with smooth scales; those on the lower portion of the fore-arm and tarsus very little larger than on the humerus and thigh. Scales on the under part of the feet smooth, convex; toes with transverse plates below; those beneath the proximal portions of all the toes, except the first on the fore-feet and the fifth on the hind-feet, divided in the centre[1]; plates near the claws undivided. Tail with all the scales keeled and in distinct rings.

Habit of body moderately stout, rather depressed: tail more than twice the length of the body; head conical; limbs moderate; when the fore-leg is laid forward the longest toe reaches to the nostril, the hind-limb extends about four-fifths of the distance to the axil. Length 17 in., of which the tail from the anus measures 13.5;

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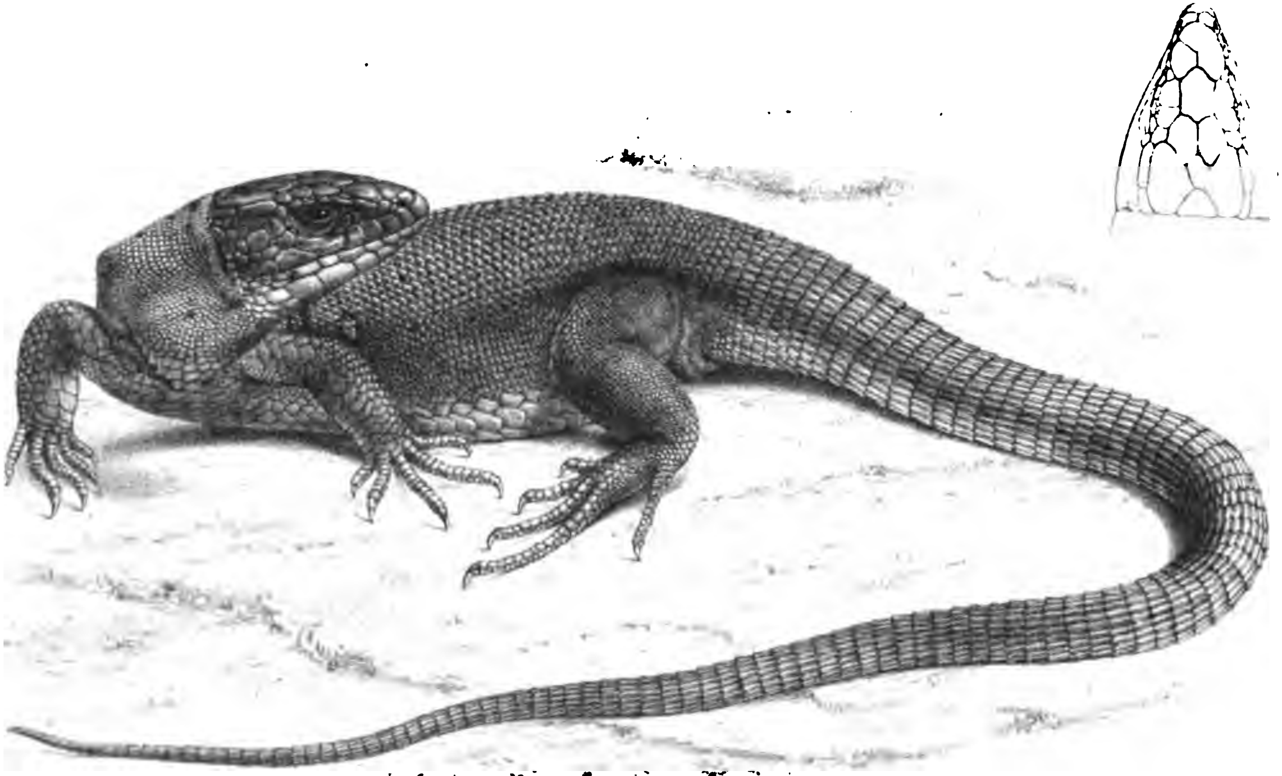
[1] This may of course be an individual peculiarity.

the head, from the snout to the hinder margin of the occipital shields, 1.15; fore-limb, to the end of the toes, 1.75; longest toe (third or fourth) 0.5; hind-limb 2.7; longest toe (fourth) 0.95.

Colour:—Olivaceous grey above, whitish below; there are a few small black spots on the back and sides of the neck, and a row of three or four blue ocelli (those in front double), with black margins, behind each shoulder, extending in a line for a short distance down each side. The sides of the head are bluish, a tint especially marked on the labials; throat yellow.

Head shields:—Rostral moderate, broader than high; nasals forming a suture behind the rostral, and articulating also with the rostral and upper postnasal. Nostrils in the lower posterior angle of the nasal shield, surrounded by the nasal, rostral, first labial, and two small subequal postnasals. Præfrontal single, broader than long; postfrontals each about equal in size to the frontal, meeting behind it in a broad suture: their length exceeds their breadth, and the posterior margin of each is very convex exteriorly where it fits into the hollow between the vertical and superciliary disk, and concave towards the middle to receive the convex anterior edge of the vertical. Vertical with a very slight groove in the middle; sides parallel, anterior and posterior margins convex in the middle. Superciliary shields four on each side; the anterior small, the two central ones nearly equal; posterior about one-third the size of a central one; only a very few granules along the exterior edge of the central superciliaries between them and the supraorbital ridge. Two anterior occipitals of rather irregular form, convex in front and behind, and with a salient angle exteriorly, each a little smaller than the vertical. Two postoccipitals (parietals), each about treble the size of an anterior occipital; two central occipitals; the anterior the smaller, with an oval depression in the centre; the posterior nearly triangular, its posterior margin forming a right line with the same margins of the postoccipitals. Two loreals, the posterior about double the size of the anterior; eight upper labials, the last small; the sixth enlarged above and forming the lower portion of the orbit. Temples covered with polygonal shields all much larger than the neck scales, those in front larger than those behind, and two elongate shields above touching the postoccipitals. Ear-opening not toothed; a rather large shield on the upper anterior edge. Lower labials six; five pairs of chin shields, the three first in contact in the middle of the chin, the fourth the largest.



[illegible]

Mintern Bros imp

LACERTA PRINCEPS

Of this very fine lizard but a single specimen was obtained. This was shot by my collector in brushwood on a pass near Niríz, about 100 miles east of Shiráz, and at an elevation of about 7000 feet above the sea.

The nearest allies of this form appear to be *Notopholis Fitzingeri*, Weigman, and its allies, which have similar scales on the back. All are small and differ widely from the present species. They are placed by Gray (Cat. Liz. Brit. Mus. p. 34) in the genus *Notopholis*. But the type of *Notopholis* of Wagler, as Duméril and Bibron pointed out, had previously been separated as *Psammodromus* by Fitzinger, and the type species *P. Hispanicus* differs in important generic characters from the *Lacertæ* with rhomboidal scales of the type of *L. Fitzingeri*.

39. **Ophiops elegans, Mén.—De F.**

Mén. Cat. Rais. p. 64.—Eichwald, Fauna Casp.-Cauc. p. 78, Pl. XII, fig. 1-5. —Anderson, P. Z. S. 1872, p. 374.

Amystes Ehrenbergi, Wiegm. Archiv. f. Naturgesch. 1835, p. 1.

Ophisops elegans, Dum. et Bibr. Erp. Gén. v, p. 259, Pl. 53, fig. 1.

1, 2, 3.	Kúh-i-hazár, south-east of Karmán ..	8000–10000
4.	Karmán	5000
5–10.	Sarján, south-west of Karmán	5000
11.	Niríz, east of Shiráz	—
12–22.	Between Karmán and Shiráz (labels illegible)	—
23–26.	Between Shiráz and Tehrán (labels illegible)	—
27.	North of Isfahán	—
28.	Kohrúd, north of Isfahán	7000
29.	Near Tehrán	4000

The above series shows less variation in the characters of the head shields than I should have anticipated from that shown by its Indian ally *O. Jerdoni*, (conf. Stoliczka, J. A. S. B. 1872, xli, pt. ii, p. 89.) In no case do I find more than two post-nasals, and I have not a single example in which these shields or the two nasals are united, but in two specimens from Southern Persia the lower nasal is joined to the lower postnasal, so that the nasal shields resemble those in *Chondrophiops* or *Eremias*. In one instance the anterior loreal is divided longitudinally on the *canthus rostralis*, and I cannot help thinking that this shield is included when the species is stated, as it is by some writers, to have three small shields behind the nostril. In only one specimen is the anterior frontal divided, as it is represented in Duméril and Bibron's figure. In specimens described by Dr. Anderson from Shiráz the postfrontals were not in contact in every case, but they are so in all collected by me, and divided by a suture of some length. The number of labials varies slightly of course; usually there are four upper labials before the suborbital shield and three behind, but not unfrequently one of the shields is divided or else two are united. Duméril and Bibron's figure agrees with most Persian specimens, except that in the latter the præfrontal is not divided.

The ventral shields appear more variable than usual. The number of transverse rows, counted from the corner of the fold before the shoulder to the groin, ranges from twenty-four to thirty-one, the latter number being, however, clearly exceptional. Duméril and Bibron and Anderson give the number of rows across the belly as eight, but in most of the specimens before me there are but six rows of broad scales, with a much narrower series along each edge. In a few specimens, however, this outer row is half as broad as the next. The femoral pores are usually nine or ten in each thigh. There are about twenty-six scales round the body, not including the ventral plates. This is rather more than the usual number in the closely allied *O. Jerdoni* of India, which is distinguished by its rugose head shields, and, to judge by the only specimen which I possess, its much larger scales in the centre of the back and large shields between the occipitals. The scales on the back of the neck in *O. elegans* are granular, as in *O. microlepis.*

The largest specimen collected measures a little over 6 in., of which the head and body from the nose to the anus measure 2. Usually, however, the tail is not quite twice the length of the head and body.

The following is the colouration of fresh specimens noted from those taken on the Kúh-i-hazár, near Karmán. General tint above brownish olive or dull olive, with two more or less well-marked white bands down each side; the upper, which runs from the superciliary ridge, being the best marked. A well-defined dark band between the two white streaks. In many specimens there are black spots on the labials and along the sides of the back, less frequently in the centre. Some specimens have a black line in the middle of the hind neck and anterior portion of the back. In specimens from Northern Persia there is sometimes no trace of the white bands on the sides, and the dark band running back from the eye is replaced by a dull reddish brown one.

In a female captured in July I found four eggs, each about $\frac{4}{10}$ of an in. in length.

O. elegans is a common lizard on the Persian plateau. I did not meet with it in Balúchistán, and it appeared in Southern Persia not to occur below about 4000 to 5000 feet above the sea, but in the North it was common at a lower elevation. On the Kúh-i-hazár, near Karmán, I saw it at an elevation of at least 10000 feet, but I did not notice it upon the Elburz mountains near Tehrán, although it abounded in the plain between Tehrán and Kazvín. As a rule, it was found on rather stony plains and slopes of hills. I did not observe it in the sandy semi-deserts, where forms of *Eremias* are more common. It is very active and not easily captured.

I somewhat doubt whether *Ophiops macrodactylus*, Berth. 'Gottingen Abhandlungen,' i. p. 58, is more than a variety of *O. elegans*. The colouration described is certainly similar to that of some specimens of the latter, the length of the tail is not excessive, and the remaining characters scarcely appear to me of specific importance.

40. **O. meizolepis** (Stol.), Pl. XXV, fig. 2, 2 a.

Gymnops meizolepis, Stol. Proc. As. Soc. Bengal, 1872, p. 124.

1–6. Banks of the Shat-el-Arab, Basrah, Mesopotamia.

I am unable to note any character by which this little lizard can be distinguished from the species described by Stoliczka from the Panjáb. The legs are a little shorter, the fore-foot not quite reaching the end of the snout instead of extending beyond it, whilst the hind-foot laid forward reaches the ear instead of the eye, but in all other respects the specimens agree with Dr. Stoliczka's description. I presume that in giving the number of 'lateral transverse rows of scales between the fore and hind limbs' as forty-five, Dr. Stoliczka refers to the small scales on the sides. I count about the same number, but of the enlarged ventral shields between the rudimentary collar and the groin there are twenty-four to twenty-nine transverse rows.

There is nothing in the character of the scales which distinguishes this species from *O. elegans*, and as in writing of the latter I have shown that the lower nasal and lower postnasal are sometimes, though rarely, united, I can no longer consider that the subgenus *Chon-*

[illegible][1], which I proposed for *O. microlepis*, is worthy of distinction.

O. microlepis was found abundantly on the bank of the Shat-el-Arab, the river formed by the union of the Tigris and Euphrates, opposite Basrah (Bussora of many maps). Though the locality is not in Persian territory the frontier is at no great distance, and there can be but little doubt that this and other forms met with near Basrah occur within Persian limits also.

41. **Eremias Persica**, W. Blanf. Pl. XXVI. fig. 1, 1 a.—De F.

Ann. and Mag. Nat. Hist. July 1874, xiv. p. 31.
E. [illegible], De F. Viag. in Persia, p. 354, nec Pallas.

1.	Mugas, Baluchistan	4500
2-5.	Rayin, south-east of Karman	7000–8000
6.	Kuh-i-Hazar near Rayin	10000
7-9.	Karman	5000
10-14.	Between Karman and Shiraz [illegible] ..	—
15-25.	Near Isfahan	—

E. major, caudâ elongatâ, corporis longitudinem duplo vel plus quam dimidio excedente, membris longioribus quam in E. argutâ, Pall., *pede anteriore ad rostrum attingente, posteriore ultra humerum; scuto infraoculari ad labrum pertinente, supralabialibus ceteris* 5–7 *antice*, 3–4 *postice; squamis caudalibus basin versus haud carinatis; adulta supra grisescenti castanea nigro sparsim maculata, fasciâ latâ nigrâ vel nigrescente, interdum albo maculatâ vel interruptâ utrinque ad latus ornata; dorso in ætate juniore albo nigroque longitudinaliter fasciato, lateribus membrisque superne nigris, albo-maculatis; ceterum* E. argutæ, *Pall.*, E. *velocique similis.*

Habitat frequens fere in omnibus planitiebus Persicis quæ altitudinem circa 3000 pedum supra mare superant.

Description:—Palatal teeth present. No interoccipital behind. Lower eyelid opaque, granular. The infraorbital shield extends to the upper lip; there are from five to seven supralabials in front of it, and about four behind. Temples covered with small granular scales. Collar distinct, free. Dorsal scales circular, convex, in transverse rows, with a few minute granules between. Ventral shields, fourteen to sixteen across the middle of the abdomen, in about thirty-one transverse rows, arranged in oblique, not in longitudinal series. No enlarged præanal shields. Tail in rings, all the scales perfectly smooth except near the tip, where some show convexity in the middle. Femoral pores eighteen to twenty-four (usually about twenty) in each thigh, the two series closely approaching each other and being only separated by two scales in the groin. The fore-leg laid forward reaches to the end of the snout, laid back it extends about three-fourths of the distance to the thigh; when the hind-limb is laid forward, the toes come in front of the shoulder, always reaching the collar and in some specimens to the ear. The body is stout for the genus; and the tail, when perfect, from about half as long again as the body to nearly twice its length.

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[1] Jour. As. Soc. Bengal, 1873, xlii, pt. 2, p. 144, olim *Gymnops*, J. A. S. B. 1870, xxxix, pt 2, p. 367.

Colour:—The adult when alive is chestnut brown on the back and the upper parts of the limbs, with a more or less strongly marked grey tinge, and dotted over with rather small black spots (never with ocelli, as in *E. arguta*) rather irregularly dispersed, or arranged in lines. There is usually a broad black or brownish black stripe, spotted with white down the upper part of each side, but this is occasionally broken up into patches or spots; in many specimens there is a narrower dark stripe or more commonly a line of black spots along the side, below the upper black band, from the axil to the thigh. Lower parts white. Young specimens show a totally different colouration, so distinct indeed that they might easily be taken for a different species. The back is marked with about four longitudinal black bands alternating with white or pale brown stripes, the sides and the upper part of the limbs are black or blackish, spotted with white. As the lizards grow older the black bands on the back appear to break up into spots. Some specimens are dark brown with white spots at this stage.

Head shields:—Rostral rather broader than high. Nasal shields much swollen, the upper nasals meeting in a suture behind the rostral; lower nasals about equal in size to the upper, just touching the rostral in front, and extending along the upper surface of the two anterior upper labials. Loreal small, nearly square, followed by a large præocular, which extends to the upper surface of the head. Præfrontal hexagonal, about as long as broad; postfrontals convex, each very little smaller than the præfrontal, meeting in a broad suture in front of the vertical, which is longitudinally grooved in front, where it is about twice as broad as behind; the anterior margin is strongly convex, the lateral edges concave. The superciliaries consist of two larger subequal semi-elliptical shields, meeting in a straight line, with a row of granules along their outer edge separating them from the elongate or granular shields forming the superciliary ridge; in front of and behind the superciliaries is a small triangular space chiefly occupied by small granular scales with one rather larger shield behind. Anterior occipitals small, each about the same size as one of the frontals, rather irregularly triangular; posterior occipitals as broad as long, each about three times as large as a praeoccipital; a very small central occipital, no azygos interoccipital shield (*plaque occipital*, D. and B.). Upper labials five to seven in front of the large infraorbital shield, which extends to the lip; three or four smaller supralabials, gradually diminishing in size backwards, behind the infraorbital; five or six pairs of chin shields, the first three generally meeting in the middle, the third and fourth pairs largest, sixth when present very small, the anterior four pairs in contact with the lower labials.

Scales of the back rather larger and less convex than those on the neck; there are a few granules interspersed between them, which are more numerous on the sides. I count sixty-five scales across the middle of the back from the ventral plates on one side to those on the other. Scales of the throat about the same size as those of the back. Collar slightly curved backward, consisting beneath of about nine enlarged scales, those in the middle the largest, and those at the sides becoming gradually smaller, until they are no larger than the neighbouring scales. The ventral shields are not in longitudinal rows; they are in very distinct transverse lines as usual, and in less marked oblique series; there are fourteen to sixteen across the middle of the belly, and thirty-one or thirty-two transverse series from the collar to the groin. The scales in front of the anus are very irregular, usually they are all nearly the same size, sometimes some of those behind or in the centre are rather larger than the others. The scales beneath the tarsus are very broad, those in the middle extending completely across; scales beneath the feet lozenge-shaped, sharply keeled, the direction of the keels being transverse to the foot on the hind-feet, longitudinal on the fore-feet. Caudal scales perfectly smooth near the base, and, in adults, for at least the anterior half of the tail; near the tip they are bluntly keeled, and in young specimens the keeled scales are found to extend rather farther forwards.

This fine lizard grows to a length of between 9 and 10 in. A specimen obtained near Karmán, with a perfect tail, is 9.5 in. long, of which the tail from the anus measures 6 in., but in this the tail is longer than usual. A perfect specimen, from near Isfahán, measures 9 in., of which the tail from the anus measures 5.5, head 0.75, fore-limb to the end of the toes 1.4, hind-limb 2.15.

Eremias Persica is common in almost all parts of the Persian plateau where there are open plains, not absolutely desert. It is usually found amongst bushes, on sandy or gravelly soil, at an elevation of not less than 4000 feet above the sea. I first saw it on a plain covered with bushes, near Magas, in Balúchistán, and thence met with it in most suitable places till beyond Tehrán. It is very active in its movements. So far as I have observed, I do not think it lives in holes, although it will of course take refuge in a hole made by another animal. I met with these lizards in pairs in May, and once captured a male which had actually seized the female. The former had his claspers fully exserted, and upon capturing him, he discharged the seminal fluid through them.

I frequently met with young lizards of this species throughout the summer, some of them (not very small) as early as the end of April, and at Ráyín, at least 7000 feet above the sea.

E. Persica was collected in Northern Persia by De Filippi, who, however, mistook it for its near ally *E. variabilis* (*E. arguta*), and specimens obtained by the Marquis G. Doria, I believe near Tehrán, are preserved in the British, Turin, and Genoa Museums. De Filippi also states that he found *E. variabilis* abundant in Armenia, but as I did not see any specimens at Turin, I cannot help thinking it possible that he may have mistaken *E. velox* for it. Still, it is equally probable that the present species may be met with as far west. To the eastward it has been brought from Nasirabád, in Sístán, by Major Euan Smith.

This species may be distinguished from *Eremias arguta* (v. *variabilis*) by its much longer tail and limbs, by the infraorbital shield descending to the lip, which it does not do in *E. arguta*, by the larger number of upper labials, and femoral pores; of the latter there are about ten in *E. arguta*, twenty in *E. Persica*. From *E. velox* it is distinguished by its larger size, by its upper caudal scales near the base never being keeled, and by the scales beneath the palms of the feet being keeled, which they are not in *E. velox*.

On Plate XXVI, fig. 1 represents the adult lizard, 1 a the young.

42. E. velox ? (Pall.)

Lacerta velox, Pall. Reise, i, p. 718, No. 40.
L. argulus, Eichwald, Zool. Spec. Ros. Pol. iii, p. 188.
Podarcis velox, Eichwald, Fauna Casp.-Cauc. p. 76.
Aspidorhinus gracilis, Eichwald, Fauna Casp.-Cauc. p. 74.—Gray, Cat. Liz. Brit. Mus. p. 42.
? *Eremias cæruleo-ocellata*, Dum. et Bibr. Erp. Gén. v, p. 295, partim.
Eremias velox, Gray, Cat. Liz. Brit. Mus. p. 40.

1-3. Ghílán, south of Resht.

The three specimens which, with a little hesitation, I refer to this species, are in some respects intermediate in character between it and *E. Persica*, for they have the tail scales either smooth or very bluntly keeled. In the true *E. velox*, of which I obtained a specimen at Bákú, on the Caspian, all are distinctly keeled. In size however, in colouration (which differs from that of *E. Persica* in the absence of black spots on the back, and the occurrence of black-edged white markings), and in the want of keels on the scales beneath the palms of the feet, the specimens agree with *E. velox*.

I think it almost certain that *Aspidorhinus gracilis*, Eichwald, is founded on the young of this species, which differs so much in appearance from the adult that, but for the parallel case of *E. Persica*, I should not have recognised it. A specimen procured by me in Ghílán agrees very well with Eichwald's figure and description.

I doubt if the *E. cæruleo-ocellata* of Duméril and Bibron from the Crimea be not another species, for it is said to have no palatal teeth, whilst they are clearly present in the specimens of *E. velox* collected by me. The number of femoral pores also appears larger in *E. velox*, and the colouration different. Dr. Anderson refers to *E. cæruleo-ocellata* specimens from Yarkand, which agree with Messrs. Duméril and Bibron's description, but he does not mention the palatal teeth nor the presence of keels on the caudal scales in his description, P. Z. S. 1872, p. 373. If, however, his identification be correct, it shows that the different forms of *Eremias* belonging to the typical group have a peculiarly complicated geographical distribution.

43. Eremias fasciata, W. Blanf. Pl. XXV, fig. 3.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 32.

1.	Magas, Balúchistán	4500
2, 3.	West of Rígán, Narmashír	2500
4–12.	Near Saidabád, Sarján, south-west of Karmán	5500

E. *sexpollicaris, gracilis, elongata; caudá corporis longitudinem duplam æquante vel superante; collare libero, recto; squamis dorsalibus parvis, rotundatis, convexis; caudalibus superioribus carinatis; ventralibus in series transversas circa* 32–35, *singulas in medio abdomine e* 14–16 *scutis, oblique nec longitudinaliter ordinatis, compositas; præanali uná sæpe, haud semper majore, poris femoralibus utrinque* 16–19; *scuto præfrontali unico a rostrali supranasalibus et a verticali postfrontalibus longè discreto, supraciliaribus duobus æqualibus granulis fere vel omnino circumdatis; interoccipitali posteriore nullo; infraorbitali ad labrum pertinente; dentibus palatalibus nullis; supra albida vel fulvescenti-grisea, fusco longitudinaliter fasciata; membris superne fuscis, albo-maculatis.*

Hab. in Persiá meridionali haud procul ab urbe Karmán, et in Gedrosiá (Balúchistán) haud frequens.

Description:—No palatal teeth. No interoccipital behind. Lower eyelid opaque, granular. The infraorbital shield extends to the lip; there are six or seven (more rarely five) supralabials in front of it, and three or sometimes four behind. Temples covered with small scales. Ear-opening moderate, about the same size as the eye; margin not toothed, with one large scale above in front. Collar distinct, free, nearly straight, consisting of a variable number, usually about eight to ten enlarged scales, the largest being in the middle, whence they diminish gradually in size on each side; sometimes only the central scales are larger than those in front. Dorsal scales circular, convex, in transverse rows, those on the back of the neck a little smaller, whilst on the flanks they become larger and flatter; I count from forty-five to fifty scales in each transverse row across the back, from the ventral plates on one side to those on the other. Tail scales in distinct rings, all sharply keeled except those beneath near the base. Ventral shields in thirty-two to thirty-five transverse rows, each in the middle of the belly consisting of fourteen to sixteen rhomboidal plates, not arranged in longitudinal rows, but in oblique series. There is usually a larger scale in front of the anus, but it is by no means constant; in some specimens all the scales near the anus are rather larger than in front, whilst in others all are of about the same size. There are from sixteen to nineteen femoral pores on each thigh, the two series being separated by about four scales in the groin.

Both body and tail are elongate, the latter especially so, being when perfect twice, or more than twice, the length of the head and body. The fore-limb laid forward reaches the end of the snout, the hind-limb to between the shoulder and ear, occasionally extending to the latter.

Colour:—Head uniform pale brown above; back light brown to white (paler in specimens from Narmashír and Balúchistán), with from six to eight longitudinal dark brown bands, equal to the interspaces in breadth, extending the whole length of the body, and each pair uniting and terminating on the anterior portion of the tail, or occasionally in the middle of the back. Limbs above dark brown spotted with white or pale brown. Lower parts white.

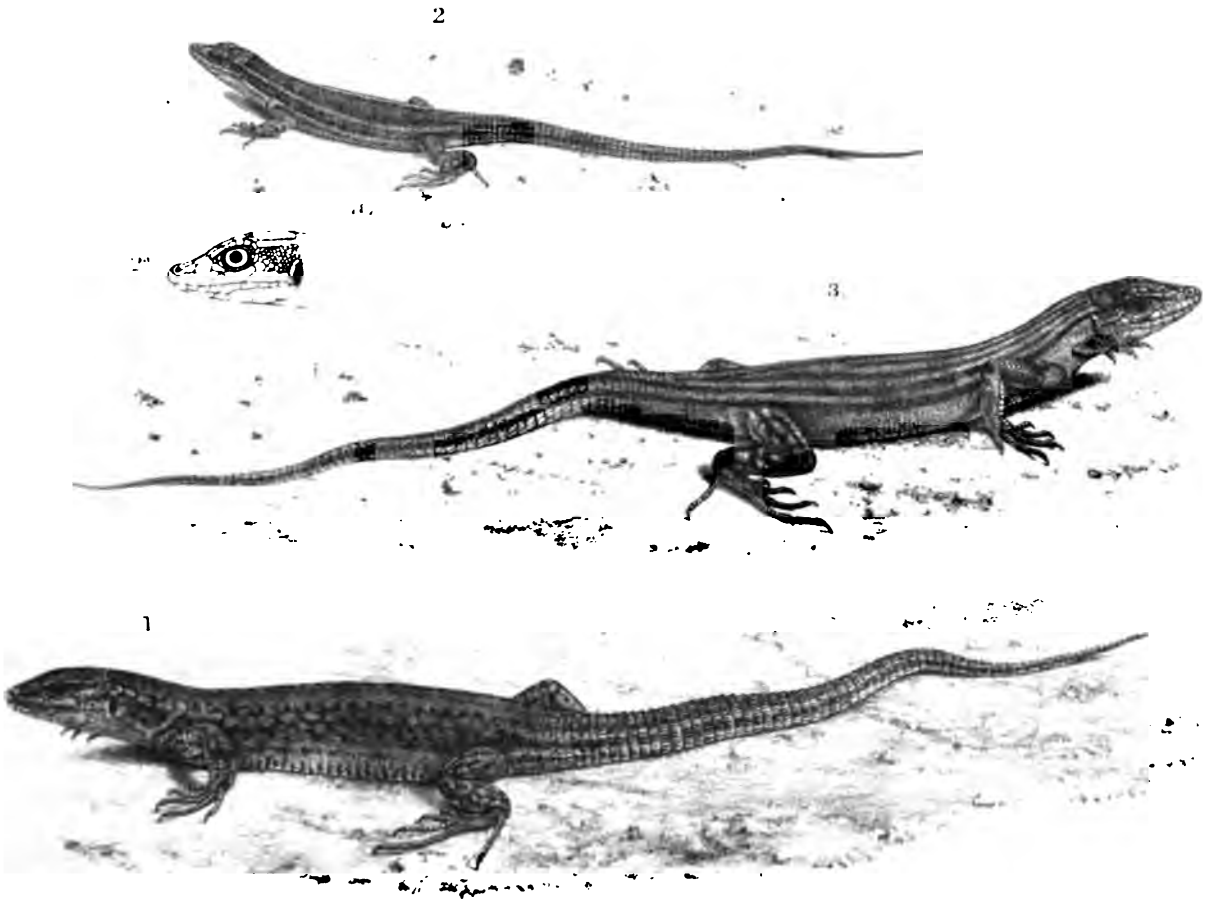
Head-shields:—Rostral rather broader above than below, and about as high as broad. Nasal shields moderately swollen; the upper nasal meeting the rostral and just touching the first labial on each side in front, and the pair forming a broad suture and separating the rostral from the præfrontal; lower nasal touching the three first labials. Loreal about as broad as high. Præfrontal single, hexagonal, broader than long, broadly separated from both the rostral and vertical. Postfrontals each very little smaller than the præfrontal, meeting in a broad suture before the vertical. Vertical about twice as long as broad, nearly twice as broad in front as behind, with a rather shallow broad groove on its anterior surface; front margin very convex, lateral edges concave. Superciliaries two, equal in size and semi-elliptical, in most specimens entirely surrounded by granular scales, but in some cases these are wanting along the middle of the inner edge. Præoccipitals each about the size of a frontal. Postoccipitals each about four times the size of a præoccipital, equally broad and long, the posterior margin of the two being a straight line. A very small central occipital with a tubercle in the centre, no shield behind it. Five pairs of chin shields, the first three meeting in the middle, third and fourth the largest; all are usually in contact with the lower labials.

Scales of the throat rather larger than those on the back. Shields beneath the tarsi very broad, extending quite across. Scales beneath the feet not keeled.

The length is usually from six to seven inches. A fine specimen from Sarján measures 6.8 in., of which the tail is 4.5, head 0.55, fore-limb 0.8, hind-limb 1.5.

This species closely resembles young individuals of *E. Persica*, but it is much more elongate, and may be distinguished at once from

Pl. XXV
Zoology of Persia



J. H. Ford del.

Mintern Bros imp.

1 LACERTA BRANDTI
2 OPHIOPS MEIZOLEPIS
3 EREMIAS FASCIATA

that species and all its allies by the absence of palatal teeth, and usually by the superciliary shields being surrounded with granules on their inner edge. From *E. Persica* it may further be known by the caudal scales being keeled and those beneath the feet flat, by the inferior nasal articulating with three supralabials instead of two, by the rostral being narrower in front, the præfrontal shorter compared to its breadth, the less numerous scales round the body, and by the longitudinal dark bands on the sides not being spotted with white.

I found one specimen of *E. fasciata* near Magas, in Balúchistán, on the same day and in the same spot as I procured my first specimen of *E. Persica*, on an elevated plain covered with bushes. I again met with this species on the fertile plain of Narmashír, south-east of Bam, and once more in the much higher plateau of Sarján, on the road between Karmán and Shiráz. In the two last-named places it was common, but I saw it nowhere in the intermediate country. Its habits present nothing remarkable; it lives on bushy plains, and is very active and difficult to catch.

44. **Mesalina pardalis** (Licht.).—De F.

Gray, Cat. Liz. Brit. Mus. p. 43.
Eremias pardalis, Dum. et Bibr. Erp. Gén. v, p. 312.—De F. Viag. in Persia, p. 354.
? *E. Watsonana*, Stol. Proc. As. Soc. Bengal, 1872, p. 86.

1.	Rás Malán, Balúchistán	2000
2–7.	Gwádar, Balúchistán	—
8–17.	Dasht river, Balúchistán	—
18–20.	Mand	700
21–23.	Zamrán, Balúchistán	2000
24–26.	Bampusht, Balúchistán	3000
27.	Magas, Balúchistán	4500
28, 29.	Ráyín, south-east of Karmán, South Persia ..	8000
30, 31.	Karmán	5000
32–34.	Sarján, south-west of Karmán	5500
35.	Near Isfahán ? label illegible.	
36.	North of Isfahán	(?)
37.	Near Tehrán	4000

The best distinction of the genus *Mesalina* from *Eremias* appears to be the character of the ventral shields, which are in longitudinal rows in the former and in oblique rows in the latter. The principal character assigned by Gray, viz. the large præanal shield of *Mesalina*, varies in individuals.

The above series of this lizard comprises specimens agreeing well with typical North African examples in the British Museum, and with Duméril and Bibron's description; but considerable variation is exhibited. Thus, the large præanal plate, just mentioned above, is very unequally developed; usually it is large, and occupies a considerable proportion of the area between the anus and the groin, but in some cases it is very little larger than the scales around it. The ventral plates are in ten longitudinal rows, the two outer of which are very much narrower than the others; but I do not think they are ever wanting, although they are often broken up into smaller scales in the anterior and posterior portions of the abdomen, and in one specimen (and only one) of the large series before me they are thus broken up almost throughout. The number of transverse rows is usually 28 to 31, sometimes as few as 27, and occasionally as many as 34. Femoral pores 11 to 15, the commonest number being 12. There are about 45 to 50 granular scales round the middle of the back from the ventral plates on one side to those on the other, those on the sides near the ventral plates being larger than those on the back. The hind-foot laid forward sometimes reaches the ear, in other cases it barely extends beyond the shoulder; the fore-limb sometimes extends to the end of the muzzle, but usually falls short of it. But few of the specimens collected by me exceed five inches in length; one, however, measures 5.75 in.

The transparent disk on the lower eyelid is single or double, or occasionally divided into three or four. The interoccipital plate between the hinder portion of the postoccipitals is usually well developed, and forms a suture with the central occipital, separating the postoccipitals from each other, but occasionally the interoccipital is quite minute, and not sufficiently produced in front to meet the central occipital, or there may be another small plate interposed between the two.

The *colour* is dark slaty grey above, with small black spots, often edged on one or both sides by white, or sometimes forming small ocelli with a white centre, and usually with a tendency to form longitudinal lines, especially towards the sides. The markings are sometimes very faint or altogether wanting. Lower parts white, sometimes with a yellow tinge on the chin and throat. In some specimens the markings on the upper parts are very distinct, in others scarcely perceptible. At the beginning of July I found specimens near Isfahán with the chin, throat, and breast yellow. They were probably breeding at that time.

Mesalina pardalis chiefly inhabits stony plains or gentle slopes, where there is not much herbage or bush. I did not usually notice it in the more sandy portions of the country. It appears to occur throughout Persia from the neighbourhood of Tehrán to far east in Balúchistán. I met with it first on my way from India, at Rás Malán, only 200 miles west of Karáchí; and if I am correct in believing Dr. Stolickza's *E. Watsonana*[1] to be the same, it extends into North-western India. It was common on the rocky promontory near Gwádar, and throughout Balúchistán and South-western Persia; rather less so in Central and Northern Persia, but I occasionally met with it as far as Tehrán.

45. **M. brevirostris**, W. Blanf.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 32.
E. Watsonana, Stoliczka, Proc. As. Soc. Bengal, 1872, p. 125, ex Kálábágh (? nec typus ejusd. speciei).

1-5. Túmb Island (Great Tombs), Persian Gulf.

M. *ab* M. pardali *scutis ventralibus in* 12 *series longitudinales* (*nec* 10) *ordinatis, capite breviore, minusque depresso, distinguenda.*

Hab. ad Kálábágh in regione Panjáb dictá Indiæ, et ad insulam Tumb in Sinu Persico.

This species is distinguished from *M. pardalis* by its having two additional rows of ventral plates, there being twelve in all, of which the two outer, one on each side, are, as in *M. pardalis,* not more than half the size of the other shields. It has moreover a shorter head, much less depressed in proportion to its height, and consequently the head shields are as a rule shorter in proportion to their breadth. The small azygos inter-occipital ('occipitale' of Duméril and Bibron) is moreover very minute or wanting, and the postoccipitals meet behind the central occipital, which is very little, if at all, longer than broad. The scales beneath the tarsus also are not quite so broad as in *M. pardalis*. The following is a brief description of *M. brevirostris*.

Palatal teeth none. Lower eyelid with a transparent disk (sometimes divided) in the centre. Nasal shields much swollen, the upper pair meeting in front of the single præfrontal, which is also separated by the postfrontals from the vertical. Head shorter and higher than in most allied species; from the suture between the superciliary shields to the point of the nose is about equal to the breadth of the head behind the eyes. A central occipital is present, nearly equal in size to each of the præoccipitals; posterior interoccipital rudimentary or wanting. Four or five supralabials between the rostral and the large infraorbital, which is usually divided below, a narrow supralabial being formed from the lower portion intervening between it and the lip, but this character is not constant; in some specimens the infraorbital extends to the tip. Ear-opening rather large, not denticulate in front, with an elongate plate above and in front of it. Dorsal scales convex, in transverse and oblique rows, those at the sides larger and flatter. There are about forty-three to forty-five scales round the body, not counting the ventral plates, of which there are twelve longitudinal rows, the two outermost smaller than the others, and from thirty to thirty-three transverse rows. Femoral pores thirteen to sixteen in each thigh. A large præanal plate. Tail scales in verticils, all keeled except those beneath. The fore-limb laid forward extends nearly or quite to the muzzle; the hind-limb comes in front of the shoulder. Colour dark grey, with indistinct dusky spots, pale in the centre, on the back forming more or less distinct longitudinal bands.

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[1] See under the next species.

I only obtained specimens of this form on a small island known as Túmb, and marked on the chart as Great Tombs, lying in the Persian Gulf, about seventy miles west of the Straits of Hormuz, and nearly south of the port of Bassadore in Kishm Island. The lizard was abundant among some low shrubs close to the shore.

My friend, the late Dr. Stoliczka, kindly sent me a specimen of this form from Kálábágh, in the Panjáb, as his *Eremias Watsonana*. But the type of that species from Sakkar, on the Indus, is described as having 'the belly with eight rows of enlarged trapezoid shields, one row on either side being situated at the edge,' which agrees with *M. pardalis*. I think Dr. Stoliczka must have overlooked the distinctions between these two closely-allied forms, but his description clearly does not apply to the present species, for besides the difference in the ventral shields, he states that the postoccipitals are separated by a small shield, and he does not mention the division of the infraorbital, which appears to be the rule in the form now described. I am therefore compelled to propose a new name for the latter.

46. **M. pardaloides**, W. Blanf.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 32.

1. Henjám (Angám, Angaum, or Angar) Island, Persian Gulf.

M. *peraffinis* M. pardali, *sed scutis ventralibus in series longitudinales duntaxat* 8 (*nec* 10) *ordinatis serie extremá utrinque e scutis multo angustioribus compositá.*

Hab. in insulá Henjám seu Angám dictá in Sinu Persico.

This species agrees in every respect with *M. pardalis*, except that it has only eight longitudinal rows of ventral shields instead of ten; of these eight longitudinal rows, the outer row on each side consists, as in *M. pardalis* and *M. brevirostris*, of shields not half the breadth of those forming the remaining six rows, so that there can be no difficulty in distinguishing from it such exceptional specimens of *M. pardalis* as may have the outer row ill developed, since they have still eight rows of plates nearly equal in size. The type of *M. pardaloides* has fourteen femoral pores in each thigh, twenty-eight transverse rows of ventral plates, and about fifty scales round the body, excluding the ventral shields. The hind-legs and feet are rather long, the ends of the toes reaching the ear when laid forward.

I obtained but a single specimen of this lizard. It was not rare, but as I was busily occupied, during the few hours I spent on the island, in looking after fossils, I did not collect more, as I did not then notice the difference from *M. pardalis*. The specimen captured was found on barren stony ground, the usual habitat of *M. pardalis*. Henjám, or Angám, is a small island lying south of the large island of Kishm in the Persian Gulf, not far from the entrance.

47. **Acanthodactylus Cantoris**, Günther, Pl. XXVI, fig. 3, 3 a, 3 b.

Günther, Rept. Brit. Ind. p. 73.—Jerdon, Proc. A. S. B. 1870, p. 71.—Stoliczka, J. A. S. B. 1872, xli, Pt. 2, p. 91, and Proc. A. S. B. 1872, pp. 85, 124.

1, 2.	Jáshk, coast of Persia, outside entrance to Persian Gulf	—
3-10.	Dasht river, west of Gwádar, Balúchistán	—
11.	Báhú Kalát, Balúchistán	—
12, 13.	Mand, Balúchistán	700
14-18.	Bampúr, Balúchistán	2000
19, 20.	Near Rígán, Narmashír, South-eastern Persia	2500
21-24.	Near Bam	3000

This species has been identified by comparison with the types in the British Museum. I have but little to add to Dr. Günther's original description of this species as supplemented by Dr. Stoliczka's remarks. All the series collected in Balúchistán and the neighbouring parts of Persia are adult or nearly so, and the longitudinal stripes on the back are faint or wanting, but in November, in Sind, I found young banded specimens in abundance, precisely agreeing in colour with Dr. Stoliczka's description. In every one of my specimens also the head shields are as described by Dr. Günther; there is a single præfrontal, and the postfrontals form a broad suture behind it; but in one young example from Sind the præfrontal is divided, and there is a small central plate between it and the postfrontals. I have not a single specimen in which the large infraorbital shield reaches the lip, but the breadth of the supralabials, which separate the infraorbital from the labial margin, varies greatly. The anterior edge of the ear appears almost always more or less toothed, but the number and size of the projecting scales, and the extent to which they project, are variable. The number of rows of enlarged scales in the middle of the back is eighteen to twenty in most specimens, and in some cases these terminate abruptly on the sides, and are succeeded by small scales, but in other specimens the scales in the centre of the back pass gradually into the smaller scales of the sides, there appearing to be much variation in this respect. The scales on the sides are always larger in the middle than near the shoulder and thigh, but there is much variation in the size of the lateral scales where they are largest; in some specimens only five or six scales intervene just in the middle of the body between the ventral plates and the enlarged dorsal scales, whilst in other examples there are double that number. In the same way the ventral shields are very variable in number. Günther gives twelve as the number of longitudinal rows, Stoliczka fourteen to sixteen, and I have examples in which as few as ten occur, but the most common number amongst my specimens is about twelve; there are however, very often, one or two smaller rows about the middle of the body on each side, forming a passage into the smaller lateral scales. The number of transverse rows of ventral plates is usually thirty, varying from twenty-eight to thirty-three. The number of femoral pores in each thigh is from seventeen to twenty-one, twenty being the commonest number.

The hind-limb usually extends to the ear, and in small specimens (probably immature) sometimes even as far as the eye. I have no example exceeding 9 in. in length.

Acanthodactylus Cantoris is usually found only on sand. It is peculiarly abundant in sandy places near the coast, and where hillocks of blown sand have accumulated upon plains and have remained sufficiently unchanged to permit tamarisk and other plants to grow. In such places the surface of the sand will be found marked in all directions by the tracks of these lizards, which live in holes, usually made in the raised and somewhat consolidated mounds around the roots of bushes. In these holes the animals appear to pass the night, and in them they take refuge when alarmed. In the cold season, on the Balúchistán coast and in Sind, the *Acanthodactyli* usually issue from their holes about nine or ten o'clock in the morning, when the air has become thoroughly warmed by the sun, and they retreat to them again before sunset. They are very swift, and easily alarmed, but they may be captured by approaching them very slowly and cautiously, especially if two persons approach them at once, one from each side, in which case the lizards frequently remain quiet, apparently trusting to their resemblance in colour to the soil around them for concealment. From the circumstance that I found large numbers of young in November, whilst in January and February all appeared to be nearly full grown, I think it probable that the eggs are hatched in the autumn, having probably been laid in the summer.

Acanthodactylus Cantoris abounds throughout the lower portions of Balúchistán and South-eastern Persia, but I never met with it at a greater elevation than about 3000 feet above the sea. It appears to be equally common throughout the desert portions of Sind and the Panjáb, extending eastward as far as the neighbourhood of Delhi and Agra. The points furthest west at which I found it were near Bam and at Cape Jáshk, close to the entrance of the Persian Gulf. I cannot say if it occurs on the shores of the Gulf.

48. **A. micropholis**, W. Blanf. Pl. XXXI, fig. 2.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 33.

1.	Rás Malán, coast west of Karáchí, Balúchistán ..	—
2.	Dasht river, west of Gwádar, Balúchistán	—
3, 4.	Zamrán, Balúchistán	2000
5.	Kalagán, Balúchistán	3500

6.	Dizak, Balúchistán	4000
7–9.	Magas, Balúchistán	4500
10, 11.	Bampúr, Balúchistán	2000
12–14.	Near Rígán, Narmashír, south-eastern Persia	2500

A. *squamis dorsalibus carinatis, parvis, antice et ad latera minimis; scutis ventralibus in series longitudinales* 10, *extremas angustiores, ordinatis; poris femoralibus utrinque circiter* 25; *digitis breviter fimbriatis; scuto infraorbitali plerumque ad labrum pertinente; supra griseus vel fuscus, longitudinaliter albo-striatus, membris albo-maculatis; celerum* A. Cantoris *similis.*

Hab. in Gedrosiá (Balúchistán).

Description :—No palatal teeth. The infraorbital shield as a rule extends to the lip behind the fourth supralabial, but this character is not quite constant, for I have two specimens from Magas in which the infraorbital is separated from the lip by the fourth and fifth supralabials. Temporal region covered with small scales, minute, granular, and convex above, rather larger below, and either flat or convex, but never so distinctly keeled as they usually are in *A. Cantoris.* Ear-opening usually with from two to four scales projecting so as to form a serrated edge. Scales of the back small, subimbricate, semi-oval, rounded behind and sharply keeled, arranged in transverse and oblique series, and passing imperceptibly into minute, convex, granular scales like those of an *Eremias* on the back of the neck, and into equally small, rhomboidal, bluntly keeled or convex scales on the flanks, the latter becoming smooth and increasing in size below near the ventral plates. The number of scales round the middle of the body, not including the ventral plates, is about 50 (49–53), whilst in *A. Cantoris,* although very variable, I never find it to exceed 40, and in some specimens it is only 30. Ventral plates in 28 or 29 transverse rows and in 10 longitudinal series, the outer of which on each side consists of much narrower scales than the others, and is frequently only well marked in the middle of the body. Femoral pores usually 23 to 27; in one specimen there are only 21 on one side and 22 on the other, but this is exceptional. Scales beneath the tarsi of moderate size, none of them extending more than about half the breadth of the limb. Scales beneath the feet rhomboidal, subequal, transversely keeled on the hind-feet, longitudinally on the fore-feet. Fore-toes only slightly serrated along the edge, and the fringes formed by the projections of the scales along the edges of the hind-toes are shorter than in *A. Cantoris.* Scales

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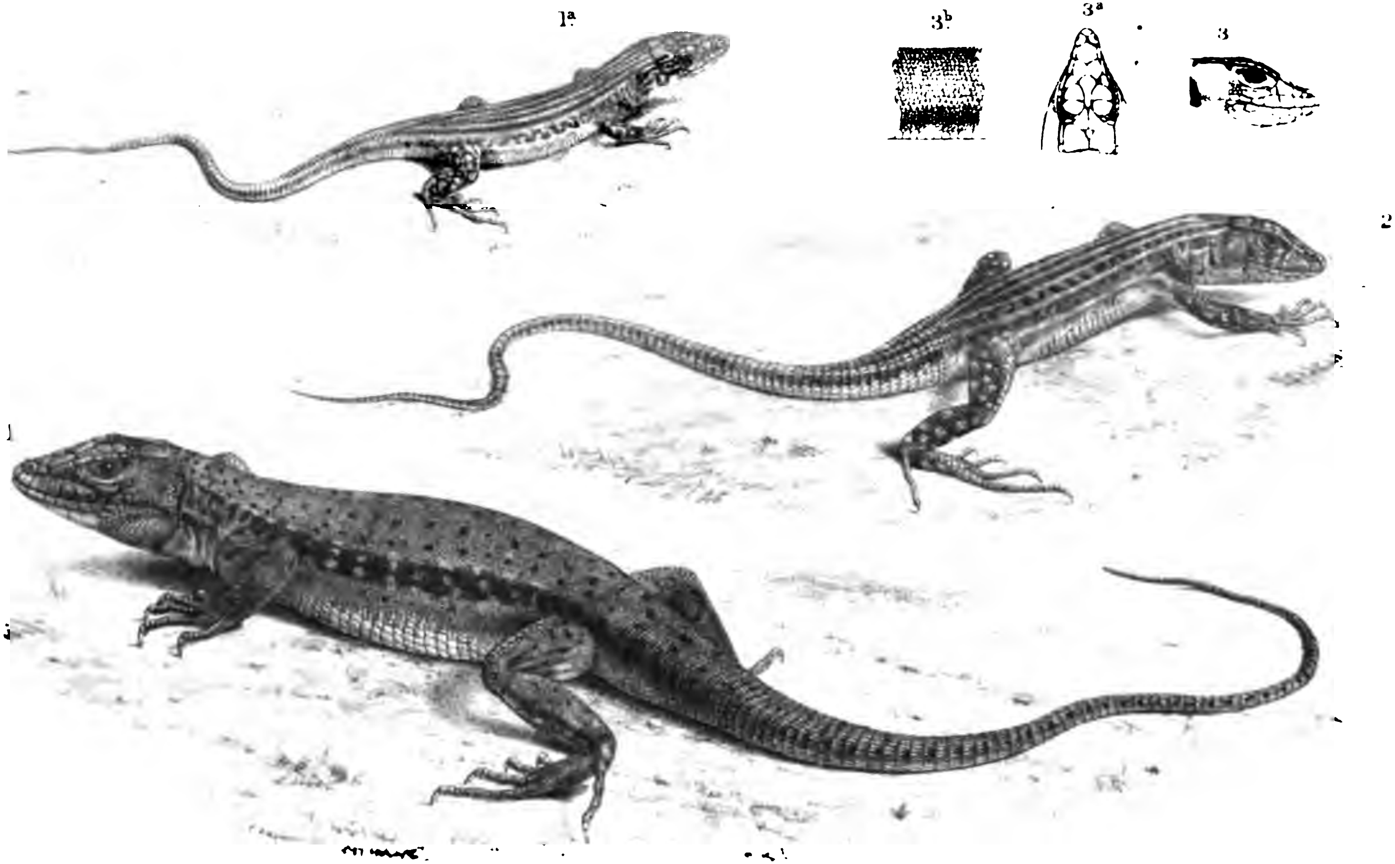

G.H. Ford del. Mintern Bros. imp.

1 EREMIAS PERSICA Adult 1ª Young
2 ACANTHODACTYLUS MICROPHOLIS
3 A. CANTORIS

of the throat about the same size as those of the middle of the back, smooth and becoming larger and more imbricate near the collar, which is quite free and consists of eight to ten scales with their points slightly projecting, and of about the same size as the anterior ventral scales. Tail scales about three times the length of those on the back, rhomboidal, in distinct verticils, all keeled except some of those underneath, the keels forming continuous longitudinal lines. The scales in the middle of the præanal region are generally larger than those on the sides, but, as in most Lacertians, they are variable.

Body and tail elongate, snout moderate, head rather shorter than in *A. Cantoris*, tail about twice the length of the head and body. The fore-limb laid forward usually reaches the end of the snout, but sometimes falls a little short of it. The hind-limb extends usually to the eye, more rarely only to the ear. The largest specimen obtained measures 8.25 in., an average example 7.25. In the latter, the head from the snout to the hinder edge of the postoccipitals measures 0.56, snout to anus 2.4, tail from anus 5.85, fore-limb to end of toes 0.95, hind-limb 1.85.

Colour:—Head greyish-brown above. Body dark grey, with five white lines down the back, and another more or less distinct down each side. Just behind the head there are six white lines, two of which meet a little way back and form a single line, which disappears on the root of the tail, where the two adjoining ones coalesce, and farther back on the tail all the bands become indistinct. The dark stripes between the white lines are sometimes blackish, with white spots, at other times grey, with small black spots or with alternating black and white dots, being more spotted towards the sides than in the middle of the back. All the lower parts white.

Head shields:—Rostral moderate, terminating in an obtuse angle above between the anterior nasals. Nasal shields slightly swollen, the anterior pair meeting in a short suture behind the vertical. Two loreals, the anterior about half the length of the posterior, their upper margin forming a distinct *canthus rostralis.* Præfrontal single, rather broader than long, with a slight hollow running longitudinally down the centre. Postfrontals each a little smaller than the præfrontal, bluntly keeled longitudinally, meeting in a broad suture in front of the vertical, which is elongate, grooved in front, where it is about twice as broad as it is behind, the anterior margin convex, the lateral margins concave and converging. Superciliary disk consisting of two large semi-oval subequal plates in the centre, a smaller shield in front, sometimes occupying all the anterior portion of the disk, but more frequently separated from the large shields by a row of granules and small granular scales, and occasionally one rather larger plate behind, a row of granules separating the principal shields from the superciliary ridge. Præoccipitals about the same size as the postfrontals, nearly triangular, with the inner angles truncated; postoccipitals more than twice the size of the præoccipitals, subquadrate, their joint posterior margins generally slightly concave in adults, straight in younger specimens; there is a very small central occipital with a small circular depression in the centre, but no ayzgos shield behind. Supralabials four in front of the large infraorbital shield, which usually reaches the lip behind the fourth labial, but in some specimens is separated from the margin by the fourth and fifth supralabial shields. The anterior portion of the infraorbital region is separate, and the infraorbital shield only touches two supralabials, differing in this from *A. Cantoris*, in which it rests upon three or four. There are usually three or four more supralabials behind the infraorbital, but they rapidly diminish in size. There are generally six lower labials on each side and five pairs of chin shields (more rarely six), the first three pairs in contact with each other, and all touching the lower labials; the third pair is the largest, but does not much exceed the second or fourth.

Acanthodactylus micropholis was found locally throughout Balúchistán, being much less abundant in the lower elevations near the coast than *A. Cantoris*, but apparently replacing that species completely at elevations above 3000 feet. It was not, however, found on the highlands of Persia, where, hitherto, no species of *Acanthodactylus* has been observed. Its habits are precisely similar to those of *A. Cantoris*, with which it is found consorting.

From its ally *A. Cantoris* it may easily be distinguished by its much smaller scales on the back, by the granular scales, like those of an *Eremias*, on the back of the neck, by the infraorbital shield resting on two supralabials instead of three or four, and usually reaching the lip, by its more numerous femoral pores, its shorter fringes to the feet, and by its colour, being always striped, even in adult specimens. The only other *Acanthodactylus* which approaches the present in its characters, viz. *A. Boskianus*, has even larger scales on the back than *A. Cantoris*.

FAMILY ZONURIDÆ.

Pseudopus apoda (Pall.) (*P. Pallasii*, Cuv., *P. serpentinus*, Merr. etc.) has not as yet been found within the territory of Persia, but it was obtained by Ménétries on the river Kúr, just north of the Persian frontier (Cat. Rais. p. 65), so that it may very possibly occur within our limits. De Filippi only observed it in the Caucasus.

FAMILY SCINCIDÆ.

49. **Eumeces pavimentatus**, Geoff.—De F.

Sc. pavimentatus, Geoff. St. Hil. Desc. de l'Egypte, p. 135, Pl. III, fig. 3, and Pl. IV, fig. 4, 4 a.—Peters, Monatsber. Akad. Berlin, 1864, pp. 48, 51.—Anderson, Proc. As. Soc. Bengal, 1871, p. 180.—Stoliczka, J. A. S. B. 1872, p. 121.

Plestiodon Aldrovandi, Dum. et Bibr. Erp. Gén. v, p. 701.—De F. Viag. in Persia, p. 354.

P. auratus[1], Gray, Cat. Rept. Brit. Mus. p. 91.

Mabouia aurata, Günther, Rept. Brit. Ind. p. 82.

Euprepis princeps, Eichwald, Bull. Soc. Nat. Mosc. 1839, p. 303; Fauna Casp.-Cauc. p. 93, Pl. XVI.

1.	Píshín, Balúchistán	700
2, 3.	Sarján, south-west of Karmán, Southern Persia ..	5500
4–9.	Near Niríz, east of Shiráz	4000–6000

I find twenty-six scales round the middle of the body in all specimens except one, which is from Píshín, in Balúchistán, and has twenty-eight, thus showing a tendency to a passage into the very closely allied *Mabouya Blythiana*, Anderson[2]. The fore-leg when laid forward in some specimens only reaches the eye, in others it extends to the end of the snout. The nasal shield is divided in all my specimens, and two central rows of dorsal scales are broader than the others, so there can be no question of Blyth's genus *Eurylepis* being identical with *Eumeces*, as has been pointed out by Anderson.

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[1] The specific name *auratus* has been applied to this species by several naturalists, in the belief that it is the *Scincus auratus* of Schneider (Hist. Amph. fasc. ii, p. 176). But Wiegmann (Archiv, 1837, Pt. i, p. 134), Gravenhorst (Act. Acad. C. Leop. Carol. xxiii, pt. i, p. 321, Pl. XXXII), and Peters (Monatsber. Akad. Wiss. Berlin, 1864, p. 51) have all shown that Schneider's type is *S. tristatus*, Daud., an American species. Moreover Schneider's specific name was taken from Linnæus, and can only be employed for the *Lacerta aurata* of the 'Systema naturæ,' a species which has never been clearly identified.

[2] Proc. As. Soc. Bengal, 1871, p. 186.

The colour is olive grey or sandy grey, with at times golden yellow longitudinal stripes, varying in breadth and distribution, down the sides. In two specimens from Sarján there are dusky longitudinal bands down the back and sides.

I met with this fine scinque but seldom in Southern Persia and Balúchistán. Most of the specimens obtained were brought to me by villagers. The few I myself saw occurred on plains covered with bushes, and on one occasion I saw two together, apparently a male and female, which took refuge in a hole beneath a stone and had to be dug out. The hole appeared to have been made by some animal, for it possessed the peculiarity of turning at right angles a short distance from the surface: I doubt if the scinques had dug it. De Filippi found this lizard common in Armenia; Eichwald, who described it again under the name of *Euprepis princeps*, and gave a very fair figure of it, obtained it from the Tálish mountains, south-west of the Caspian, and I heard of a species, which from the description was probably the same, near Tehrán, so that it inhabits the whole of Persia.

50. **Euprepes septemtæniatus**, Reuss.—De F. Pl. XXVII, fig. 3.

Mus. Senck. i, p. 47, Pl. III, fig. 1.—De Filippi, Atti Soc. Ital. Sc. Nat. vii, p. 185.

E. affinis, De F. Viag. in Persia, p. 354.

1. Kushkizard, between Shiráz and Isfahán 8000
2. Between Isfahán and Tehrán, near Kúm .. .. (?)

I have examined the typical specimens of *E. affinis* in the museums at Genoa and Turin, and compared with them the specimen obtained by myself between Isfahán and Tehrán, which agrees in every respect, except that in the former there are in each thirty-four scales round the body and about thirty-eight between the axils, whereas in the specimen I collected there are thirty-six scales round the body and thirty-five between the axils. In the other specimen, from Kushkizard, the scales round the body number thirty-four, as in De Filippi's types, and thirty-six between the axils. Of three specimens presented to the British Museum by the Marquis Doria, two have thirty-eight and the third thirty-five scales round the body.

I have also compared my specimens with the two typical examples of *Euprepes septemtæniatus* in the Paris Museum, and I have arrived at the same conclusion as De Filippi did, viz. that *E. affinis* cannot be considered a distinct species. The only differences I can see are that the postfrontals are contiguous in the specimens of *E. septemtæniatus* from Nubia, whilst they are separated in the Persian form, and that the lobules in front of the ear are larger in the latter; but these differences are insufficient for specific distinction. I find in the Paris Museum specimens of the same form from Maskat and from some other part of Arabia, which, if the localities be correct, show that this species has a wide range throughout South-western Asia. From *E. quinquetæniatus*, Wagler (*E. Savignii* Dum. et Bibr.), which I myself obtained in Abyssinia, and of which I have seen specimens labelled *E. septemtæniatus*, the last named is distinguished by the absence of keels on the scales of the anterior portion of the back and of the upper part of the limbs, and by the smaller ear-opening, which is round, not oval. I cannot help feeling some doubt, however, as to these distinctions being constant.

The following is a brief description of the Persian specimens. General form much as in *E. carinatus*, Schn. (*E. rufescens*, Shaw), and *E. quinquetæniatus*, Wagler, except that the tail is much shorter. A pair of supranasal shields, which meet in a suture behind the rostral. Postfrontals separate, each about half the size of the single præfrontal. An elongate central occipital, completely separating the postoccipitals from each other. The fifth upper labial is the largest, and forms the lower part of the orbit; it has two other labials behind it. Lower eyelid with a large transparent disk. Ear-opening rather small, circular, with two or three subequal lobules in front. Scales of the back with three very faint keels; scales of the anterior portion of the back, of the sides, and the limbs, smooth. Thirty-four to thirty-eight series of scales round the body, thirty-five to thirty-eight between the axils. Neither the præanal shields nor subcaudals are enlarged. Limbs moderate; the fore-limb laid forward extends in front of the eye.

The general colouration of Persian is very different from that of African specimens, but that of the latter is so variable, that I doubt if any conclusions can be drawn from this character. The colour of Persian specimens of *E. septemtæniatus*, to judge from those I have seen, does not appear to vary greatly; it is pale olive brown, with more or less numerous black spots on the head, back, and sides; these tend to form four longitudinal bands on the anterior portion of the back, and a broad band, produced in front through the eye, down each side.

Below this is a narrow pale line from the upper labials to above the shoulder, with a more or less marked dark band beneath it. The specimen from Kushkizard is more strongly marked than those from Northern Persia, and in this the head shields, the posterior portion of the back, and the tail are all spotted, the spots on the hinder portion of the body having rather a tendency to form transverse bands.

This species is viviparous. The large female which I captured at Kushkizard on being placed in spirit gave birth to three perfectly-formed young, each about 3 in. in length, and with an umbilical cord attached to a placenta-like mass. Two others remained inside the body. The length of this specimen was 7.8 in., of which the tail from the anus measured 3.9, fore-limb 1.05, hind-limb 1.3. It was found in a high open valley, which is covered with snow in the winter months.

De Filippi's specimen was from Kazvín, north-west of Tehrán. I saw this scinque more than once in Northern Persia, but I never met with it in the South except at Kushkizard.

51. Ablepharus bivittatus (Mén.)—De F. Pl. XXVII, fig. 2, 2a.

Scincus bivittatus, Mén. Cat. Rais. p. 64.
Ablepharus Menestriesii, Dum. et Bibr. Erp. Gén. v, p. 811.—De F. Viag. in Persia, p. 355.
A. bivittatus, Gray, Cat. Liz. Brit. Mus. p. 64.

1–5. Kushkizard, between Shiráz and Isfahán .. 8000

The specimens obtained agree with Duméril and Bibron's description, except that the nasal shields in all my specimens are widely separate, instead of being 'assez rapprochées.' I have examined the examples of this species collected by De Filippi in Northern Persia, and preserved in the Turin Museum, and compared them with those collected by myself. The differences are trifling. The head in the former is rather longer, and there are only twenty-two rows of scales round the body. In the specimens from Kushkizard there are twenty-four rows, as in the type described by Duméril and Bibron.

The *colour* noted from living specimens is pale greyish olive above, with dusky mottling which forms three more or less well-marked longitudinal lines down the centre of the back. A broader and better marked dark line runs down the upper part of each side over the shoulder, above the tympanum and through the eye, commencing from the nostril; below this is a whitish line, followed by a narrow dark line, the latter often ill-marked. The under parts in the specimens collected were salmon colour, deepest at the base of the tail; but it is highly probable that this tint is seasonal, and disappears during part of the year. The length of the largest specimen was 4.8 in., of which the tail from the anus measured 2.9.

I met with this scinque only in the locality mentioned, a high plateau, 8000 feet above the sea, traversed by the summer road between Shiráz and Isfahán. There it consorted with *Phrynocephalus Persicus*, De F., another Northern Persian species which, in the same way, was not noticed in any other part of the country south of the plains near Tehrán. De Filippi found the present species rather scarce at Tabriz and Kazvín.

Ablepharus bivittatus was met with rather commonly at the locality mentioned, on open ground, dry and level but not sandy, scattered over with very small thorny bushes, amongst the roots of which this little scinque buried itself when pursued.

52. **Ablepharus Brandti**, Strauch, Pl. XXVII. fig. 1, 1a[1].

Bull. Acad. St. Pet. xii, p. 367.
? *Blepharosteres agilis*, Stoliczka, Proc. As. Soc. Beng. 1872, p. 126.
A. pusillus, W. Bl. Ann. and Mag. Nat. Hist. July 1874, xiv, p. 33.

1–2. Basrah (Bussora), on banks of the Shat-el-Arab, the estuary formed by the union of the Tigris and Euphrates.

Two specimens of an *Ablepharus* belonging to the section with an undivided præfrontal were procured at Basrah, and were described by me l. c. as a new species under the name of *A. pusillus*. In the description, a serious error was printed, the number of scales between the axils being given as 26 instead of 36. I believe that this mistake was the principal cause of my describing the species as new, because the only important difference between the Basrah scinques and a typical specimen of *A. Brandti* in the British Museum consists in the latter having about fifty scales between the axils. The two scales above the eye forming a portion of the orbital ring are a little more developed in *A. Brandti*, but the difference is trifling.

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[1] The name printed on the plate is *A. pusillus*.

In the species described by Dr. Stoliczka from the Panjáb as *Blepharosteres agilis*, the number of scales between the axils is said to be forty to forty-five, and as the description of this form agrees perfectly in every other character with *A. Brandti*, I am disposed to believe that it is the connecting link between that species and *A. pusillus*, and that the three must in all probability be considered as varieties of one species. It is true that so much variation in the number of the ventral scales is unusual, for the transverse rows on the abdomen correspond to the number of dorsal vertebræ. In *Blepharosteres agilis* there are said to be twenty-one to twenty-two longitudinal rows of scales round the body, instead of twenty, as in *A. Brandti* and *A. pusillus*, but I do not consider this a specific distinction.

The following is a full description of the Basrah *Ablepharus*.

Description :—General form slender; body rounded, the back being slightly flattened; tail nearly twice as long as the head and body; head rather short; limbs feeble, all with five toes; the fore-limb laid forward reaches the angle of the mouth; the hind-limb extends about two-thirds of the distance to the shoulder; third and fourth toes on the fore-foot nearly equal, on the hind-foot the fourth toe is a little the longer. The scales are in twenty rows round the middle of the body, and about thirty-six from the axil to the thigh; those on the back are the broadest, and those on the sides smallest; as usual, a few rows of scales on the back of the neck immediately behind the occipital shields are very broad. Feet granular beneath; toes with transverse plates below, which have a blunt keel in the centre. There are a pair of enlarged præanals, and a row of broad subcaudals. Ear-opening small, circular, with two or three small lobules in front. The largest specimen with the tail perfect measures just three inches, the tail from the anus is 1.9, head 0.2, the fore-leg is 0.25, hind-leg 0.35 long.

Head shields :—Rostral rather broad, but scarcely extending to the upper surface of the head. Nasal shields distant from each other. Two loreals, the anterior being perhaps rather a postnasal; it is narrower and higher than the posterior. Præfrontal large, hexagonal, forming a suture both with the rostral and vertical; postfrontals small, distant from each other. Vertical elongate, its broadest portion about one-third of its length from the front, with three sides in front, two straight lateral margins behind gradually approaching each other, and a rounded posterior extremity which just touches the point of the large subtriangularly heart-shaped præoccipital. Superciliary shields three in number, the anterior much the largest, and the second larger than the third. A bell-shaped interoccipital, the anterior margin of which is slightly convex, and fits into a hollow in the broad posterior margin of the præoccipital. The postoccipitals meet behind the interoccipital.

There is a row of narrow shields, rather broader in front, between the superciliaries and the orbit; the latter is surrounded by very minute scales, in a single row except behind, two above the orbit being more elongate, but very narrow. Temples covered with large polygonal plates, the largest of which on each side above is in contact with the postoccipital. Upper labials seven, the fifth from the front being the largest, and forming the lower portion of the orbit; lower labials about six. A broad and large shield behind the mental, and three or four pairs of enlarged chin shields, in contact with the lower labials, behind it.

Colour :—Brownish olive above; a narrow pale line from above the eye down each side of the back, and a broad dark brown band below it, from the back of the orbit to above the shoulder, and continued, but less distinctly, down the side; below this are fainter lines. Limbs with rather faint longitudinal bands.

The only two specimens of this little scinque which were obtained were collected on the bank of the Shat-el-Arab (the river formed by the union of the Tigris and Euphrates), opposite the town of Basrah (Bussora), where it occurred with *Ophiops meizolepis.* I include it in the Persian fauna for the same reasons as I have given in describing that species.

This small scinque has much the form of *Ablepharus bivittatus,* but it is more slender. The largest specimen is nearly three inches long, and not thicker than a crowquill. It appears to be very closely allied to a species recently described from North-western India by Dr. Stolickza, under the name of *Blepharosteres Grayanus* (Proc. As. Soc. Beng. 1872, p. 74), the type of the genus *Blepharosteres,* which is destitute of any external ear, and is, to use Dr. Stoliczka's phrase, 'a *Mocoa* without eyelids or ears.' But as *B. agilis,* which Dr. Stoliczka has referred to the same genus, possesses an ear-opening, I doubt whether the generic distinction from *Ablepharus* can be maintained, the only remaining distinction of importance being that the anterior frontal is single in *Blepharosteres,* double in typical

Ablepharus[1]. This character, however, is the only essential distinction of the genus *Cryptoblepharus* of Wiegmann and Gray, and, as Dr. Strauch has pointed out in his monograph of the genus *Ablepharus* (Bull. Ac. Imp. Sci. St. Pet. xii, p. 359), there is no difference of generic importance between *Cryptoblepharus* and *Ablepharus*. I am therefore inclined to believe that unless the absence of an ear-opening in *Blepharosteres Grayanus* be considered a generic character, that species must be included in *Ablepharus*.

53. ***Hemipodium Persicum**, Steindachner.

Hemipodion Persicum, Steindachner, Sitzungsber. Akad. Wiss. Wien. 1867, lv, p. 263, Pl. I.

There is a specimen of this species in the British Museum, received from Vienna, and said to have come from Kúrdistán. The type is said to have been obtained by Kotschy in some part of Persia not specified.

54. **Anguis orientalis**, Anderson,—De F.

P. Z. S. 1872, p. 376, fig. 1.
A. fragilis, Mén., Cat. Rais. No. 223, p. 66.—Eich., Faun. Casp.-Cauc., p. 98.—De F. Viag. in Persia, p. 355.

A specimen obtained by Major St. John at Resht[2], in Ghílán, was described by Dr. Anderson as the type of a new species. It is distinguished from *A. orientalis* by the greater number of scales round the body (thirty one inch behind the head), and the greater division of the head shields.

I have examined the type and compared it with *A. fragilis*, and although the distinctions may possibly be individual, I think they are probably constant, and entitle the form to separation. The number of scales round the neck an inch behind the head is about thirty, but about half-way from the head to the vent there are only twenty-eight, and farther back twenty-six or less. Amongst several specimens of *A. fragilis* from Great Britain, France, and Italy which I have examined, I can find none possessing more than twenty-six rows of scales round the centre of the body.

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[1] Dr. Stoliczka says, l. c. p. 174, that *Blepharosteres* differs from *Ablepharus* by the total absence of eyelids, but I do not think he had specimens of *Ablepharus* for comparison, for in all the species of that genus which I have seen, the eyelids are precisely in the rudimentary form which he very clearly describes as occurring in *Blepharosteres*.

[2] Misprinted Rehst in the P. Z. S. l. c.

According to De Filippi, the Marquis Doria obtained *A. fragilis* at Tehrán. Ménétries says it is common at Lankorán. I did not meet with it in Persia, nor could I find any Persian specimens in the museums at Turin and Genoa.

The next two species belong to that division of the scincoid lizards which was raised by Dr. Gray to the rank of a distinct family under the name of *Sepsidæ;* and of the forms belonging to which a list with notes was given by Dr. Günther in the Proceedings of the Zoological Society for 1871, p. 240. I feel great doubt as to whether it is better to raise this subdivision to the rank of a family than to retain the name of *Scincidæ* for the whole group, because it appears to me that there is quite as much structural difference between *Scincus*, *Euprepes* and *Anguis*, all of which are retained in the *Scincidæ*, as there is between any of them and *Seps* or *Sphenops*. In the same manner I cannot see any greater necessity for placing *Ablepharus* in a distinct family from *Mabouya* and *Hinulia* on account of the absence of eyelids, than there is of removing *Ophiops* from the *Lacertidæ* or *Eublepharis* from the *Geckotidæ*.

55. Sphenocephalus tridactylus, Blyth.

Blyth, Jour. As. Soc. Bengal, xxii, 1853, p. 654. — Günther, Rept. Brit. Ind. p. 98.

I was constantly on the look-out for this curious sepsoid lizard in Balúchistán, but I never saw it. Specimens were, however, obtained by Major Euan Smith at Nasirabád, in Sistán, and they are now in the British Museum. They differ in no respect from Panjáb specimens.

56. Seps (*Gongylus*) ocellatus (Forsk.)

Gongylus ocellatus, Anderson, P. Z. S. 1872, p. 377.

Specimens obtained from Bushire by Major St. John have been described by Dr. Anderson, l. c. I have compared one of them with African examples in the British Museum, with which it agrees perfectly.

57. *Ophiomorus miliaris, Pall.

Dum. et Bibr. Erp. Gén. v. p. 799.
Anguis miliaris, Pall. Reise, i. p. 718; Zoog. Ros. As. iii. p. 54.

Pallas states that a specimen of this peculiar limbless lizard was sent by S. G. Gmelin from Persia. The exact locality is not mentioned: it was probably Mazandarán or Ghilán.

Zygnopsis[1], gen. nov.

W. Blanf. Ann. and Mag. Nat. Hist. July 1874, xiv. p. 33.

Genus affine Ophiomoro, *naribus inter duo scuta, unum supra, unum infra, supranasalibus contiguis, sed membris quatuor debilibus præditum.*

This form resembles *Ophiomorus* in the character of its head scales, the nostrils being between two shields, an infranasal and a supranasal, the supranasals meeting behind the rostral. The central plates of the head, rostral, anterior frontal, vertical, and occipital are largely developed, as in many sepsoid forms. The essential distinction from *Ophiomorus* is in the possession of small limbs, the fore-feet in the only species known being tetradactylous, the hind-feet tridactylous. I can detect no trace of an external ear. The teeth are blunt, small, almost hemispherical. The palate is not toothed, and the palatal fissure, which is rather broad, extends forward to the level of the eye. The tongue is flat and scaly, but appears not to be cleft at the end; in the only specimen I have for examination, however, the tip of the tongue has dried slightly, and when fresh it may have a minute emargination, as in *Ablepharus.* The eyes are very small, and the lower eyelid well developed but transparent, as in *Ophiomorus.*

Ophiomorus is by Duméril and Bibron included in the family of *Scincoïdiens* or *Lepidosaures*, which comprises, besides the normal scincoids, *Seps*, *Acontias*, and other forms, which have been by Dr. Gray and other writers made the types of distinct families, distinguished principally by the characters of their nasal shields. *Ophiomorus miliaris* (Pall.) is thus made the type of the family *Ophiomoridæ*, distinguished by having the nostrils between two plates, one above and one below. I feel much doubt as to whether the importance of the exact form of the nasal shields is sufficient to justify the foundation of families upon them, and, after all, the difference between some of the *Scincidæ*, e. g. *Euprepes* and *Ophiomorus*, consists only in the position of the nostril itself in the nasal shield; in *Euprepes* it is in the middle of the shield, in *Ophiomorus* it is on the upper margin; in *Seps*, again, it is in the front edge of the nasal. In all these forms we have a rostral shield, two nasals, one on each side, and two supranasals. In *Acontias* these are all united into one shield, the reverse condition being seen in *Anguis*, in which the supranasals are divided into several shields.

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[1] Etym. ζυγνίς, the name of a lizard, and a name employed by Oken, Fitzinger, and Wiegman for the genus *Seps*, and ὄψις, 'appearance.'

If *Seps* and its allies are separated from the *Scincidæ*, I am inclined to think that *Ophiomorus*, *Acontias*, and perhaps *Anguis* should be placed with them. In all there is a tendency to the development of the central plates of the head at the expense of the lateral plates, and the limbs are weak or deficient. But weak limbs are also common amongst the true scinques, and there is no trenchant character by which the sepsoid forms can be distinguished.

58. **Zygnopsis brevipes**, W. Blanf. Pl. XXVII, fig. 4, 4 a.

Ann. and Mag. Nat. Hist. l. c.

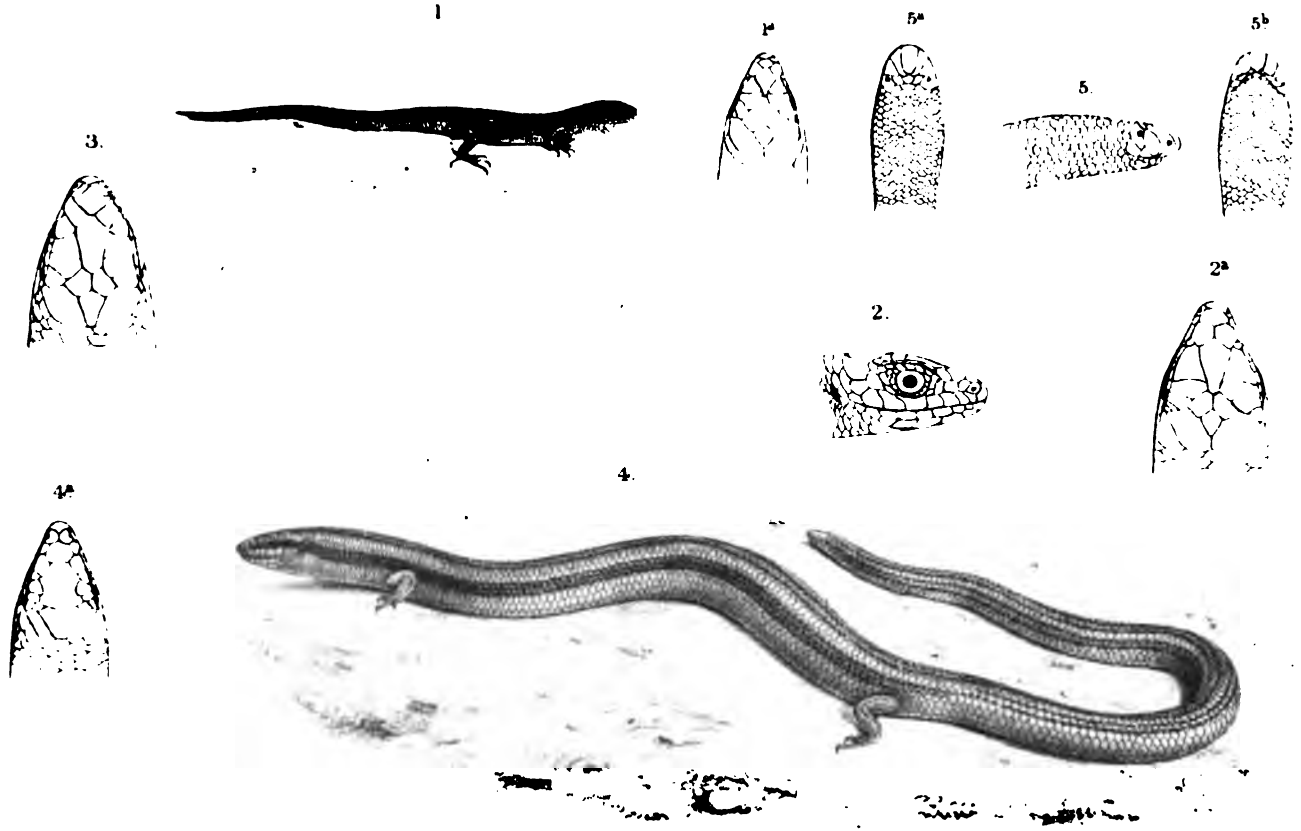
1. Sáadatabád, Sarján, between Karmán and Shiráz, South Persia 5500

Z. corpore elongato, pedibus brevibus, anticis digitis 4, posticis 3 instructis, capite conico, rostro rotundato; scuto verticali magno, postice latiore, ad latera emarginato; occipitali magno, margine anteriore concavá, posticá valde convexá; præoccipitalibus nullis, postoccipitalibus minoribus oblique elongatis; oculis parvis, palpebris inferioribus transparentibus; meatu auditorio nullo; squamis corporis lævibus, in medio corpore in 22 series longitudinales dispositis; grisea, longitudinaliter fusco-fasciata.

Hab. haud procul a Karmán in Persia meridionali.

Description :—Form anguiform, slender; body elongate, cylindrical; the tail in the only specimen is imperfect, but must have been of considerable length, and diminishes in size very slowly. The head is conical, muzzle rounded; no trace of external ears; eyes small; lower eyelid well developed, transparent. The legs are small and rudimentary; the fore-foot when laid forward not extending half the distance to the snout, and falling far short of the mouth; the hind-leg about one-fifth of the length from the thigh to the shoulder, and about equal to the distance from the shoulder to the eye. The fore-foot has four toes, the third a little the longest: the hind-foot three toes, the third the longest: all the toes, normally, are clawed, but some have lost their claws. Feet covered with smooth, imbricate scales, the toes with cross-plates below. Scales of the body smooth, all equal in size, in twenty-two longitudinal series round the middle of the body. Length of the only specimen, from the snout to the anus, 4 in., head 0.3, fore-limb 0.32, hind-limb 0.6.

Head plates:—The rostral rather large, extending to the upper surface of the head. The nostrils are in the upper part of the nasal shield, their upper margin formed by the supranasals, which are rather larger than the nasals, and meet in a broad suture behind the rostral. Præfrontal rather large, hexagonal, broader than long; it has a broad concave hinder margin, into which the front of the vertical fits. Postfrontals small, pentagonal, widely separated. Vertical very large, bell-shaped, with its broadest portion behind, and its posterior margin rather convex, meeting the occipital in a broad suture, its lateral margins rather deeply emarginate, each being cut out by a re-entering angle near the hinder edge. No præoccipitals; they are represented by two small rhomboidal shields, one on each side, between the hinder outer margin of the vertical and the postoccipital. Superciliaries four on each side, the second from the front the longest, its hinder angle on the inside projecting and fitting into the lateral emargination of the vertical. The anterior and posterior superciliaries are in contact with the granular scales of the small upper eyelid; a narrow shield between the eyelid and each of the central superciliaries. Occipital large, subtriangular, with the anterior angles truncated, anterior margin concave, hinder angle rounded. Postoccipitals represented by two obliquely elongate shields running along the outer margins of the occipital, and not meeting behind it. Two loreals, both longer than high, the anterior one in contact with the præfrontal, a small præocular behind the last. Lower eyelid transparent, a row of small shields beneath it separating it from the supralabials. Temporal region on each side covered by two large shields, that in front extending from the supralabials to the postoccipital, the hinder one touching the postoccipital only. Supralabials seven, the fifth the largest, fifth and sixth below the eye, the seventh much less in height than the others. Infralabials about six; mental rather small with two shields stretching across the chin behind it, and other enlarged shields along the edge of the lower labials.



1. ABLEPHARUS PUSILLUS
2 A BIVITTATUS
3. EUPREPES SEPTEMTÆNIATUS
4. ZYGNOPSIS BREVIPES
5. TYPHLOPS PERSICUS.

Mintern Bros imp.

Colour pale brownish grey, with longitudinal dark lines. Of these there are two narrow ones in the centre of the back and tail extending on to the head shields, and a much broader band from the nostril, through the eye, extending down the upper part of each side above the limbs and dividing into two lines on the tail.

The head is slightly injured, but not so much so as to render the plates indistinct. The only specimen obtained was brought to me at Sáadatabád, a village in Sarján, about 100 miles south-west of Karmán on the road to Shiráz, together with several specimens of *Eumeces auratus*. All were dead, and had been more or less injured in being captured, the people looking upon them as poisonous, a common belief with regard to all anguiform lizards.

OPHIDIA.

FAMILY TYPHLOPIDÆ.

59. Typhlops Persicus, W. Blanf. Pl. XXVII, fig. 5, 5 a, 5 b.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 34.

1, 2. Hills, north-east of Sarján, between Karmán
and Shiráz 8000

T. *purpurascenti-brunneus, fere unicolor, subtus vix pallidior, antice parum attenuatus; scuto rostrali mediocri, subtus parum angustiore, frontonasale latitudine haud æquante; nasali cum frontonasali supra narem juncto; præoculari antice valde convexo, oculare longitudine subæquante; frontonasalibus post rostrale approximatis, præfrontali frontali, interparietali, supra-ocularibus, parietalibusque subæqualibus, squamas dorsales latitudine paullo excedentibus; squamis corporis in* 22–24 *series longitudinales atque* 376–390 *transversas dispositis; caudá brevi, mucronatá seriebus* 9 *squamarum circumdatá.*

Hab. in Persiá meridionali.

Description:—Body nearly cylindrical, rather thin, very little thicker behind than in front; the circumference in the middle is one-fifteenth of the total length. The tail is about equal in length to the width of the head, it is curved downward and terminates in a minute spine. Series of longitudinal scales twenty-four in one specimen, twenty-two in the other; transverse rows 376–390, of which nine are round the tail. Length of the largest specimen 10.5 in., of the others rather less.

The rostral shield occupies about one-third of the surface of the head above, where its lateral margins are parallel; below it is a little narrower, but not much. Nostril lateral; a suture runs from its lower margin to the second supralabial, dividing the fronto-nasal from the nasal, but these two plates are united above the nostril, and those on the opposite sides of the head are close together, but do not quite touch each other behind the rostral. Præocular where broadest, which is just behind the nostril, of equal breadth with the ocular; the anterior margin of the former shield is very convex, and its distance from the nostril less than the breadth of the rostral below the snout. Eyes distinct; the ocular shield is slightly convex in front above the eye, nearly straight below it, and it extends back as far as the last supralabial does. The parietals, interparietal, frontal [1], præfrontal, and supraoculars differ but little from each other in size; all are rather broader than the neighbouring shields of the back. Four supralabials increasing regularly in size backwards; the first is very minute, and in contact with the rostral and nasal; the second touches the nasal, frontonasal, and præocular; the third ascends somewhat between the præocular and ocular; the fourth is large, and situated below the ocular.

Colour dull rufous brown, rather paler below; all the scales uniform in colour.

This form is evidently closely allied to *T. Syriacus* [2], Jan, 'Icon. Oph.' p. 15, livr. 3, Pl. IV, V, fig. 5, but distinguished by having the dorsal scales of the same colour throughout, instead of being particoloured, whitish in front, light yellowish brown behind, as they are said to be in *T. Syriacus*. Compared too with Jan's figure, the Persian *Typhlops* differs in having the central plates of the head broader, the ocular and præocular wider, the anterior margin of the last-named shield more convex and extending to much nearer the nostril, and the labials much more unequal in size, the posterior one being much larger.

Compared with *T. vermicularis*, the present species may be distinguished by the division between the nasal and fronto-nasal shields not extending above the nostril, by the scales of the back being uniformly coloured, by the head being longer in proportion to its breadth, and the rostral shield comparatively narrower, both above and below. In *T. vermicularis* the fronto-nasal is narrower than the rostral; in *T. Persicus* the reverse is the case.

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[1] This shield is unequally divided obliquely in one specimen.

[2] Strauch, Mem. Acad. Imp. St. Pet. xxi, No. 4, p. 27, note, shows that *T. Syriacus* is probably identical with *T. vermicularis*, Merr.

60. * **T. vermicularis**, Merr.—De F.

Strauch states (Schlangen des Russischen Reichs in Mem. Acad. Imp. St. Pet. xxi, No. 4, p. 28) that specimens of this blind snake, captured by Hohenacker at Lankorán, exist in the museum at St. Petersburg. The same *Typhlops* was found by De Filippi rather common at Erivan, by Ménétries at Tiflis and at Bákú, and it appears to abound in the Transcaucasian provinces generally. Major St. John informs me that he has seen a species near Tehrán which is probably the same, and I have little doubt of its existence in Ghílán and Mazandarán.

Family ERYCIDÆ.

61. **Eryx jaculus**, (L.)—De F.

Anguis colubrina jaculus et *cerastes*, Linn. Syst. Nat. i, pp. 390, 391.
Eryx jaculus, Dum. et Bibr. Erp. Gén. vii, p. 463.—Gray, Cat. Vip. etc. Snakes, Brit. Mus. p. 109.—Strauch, Mem. Acad. Imp. St. Pet. xxi, No. 4, p. 29.
E. Turcicus, Eichwald, Zool. Spec. iii, p. 176; Fauna Casp.-Cauc. p. 124, Pl. XVII.
Eryx jaculus, var. *Teherana*, Jan, De F. Viag. in Persia, p. 354.

1. Saidabád, 100 miles south-west of Karmán ..	6000
2. Between Karmán and Shiráz (label illegible) ..	—
3. Kohrúd, north of Isfahán	7000

Asiatic specimens of *Eryx jaculus* appear always to have the scales of the tail less strongly keeled than African; but I am not sure that the distinction is sufficiently marked to justify separation. In the three Persian examples the scales are rather convex than keeled, and in a specimen in the British Museum from Krasnovodsk, east of the Caspian Sea, larger than any collected by me, only a few scales on the upper part of the tail near its base are convex, those near the end of the tail being flat and smooth.

There is much variation in the head scales, and in the colouration of this species. The specimens brought by Doria from Tehrán, and which Prof. Jan described as his *var. Teherana*, differ somewhat in colour from those obtained in Egypt, and have smaller head scales, there being eleven to twelve round the eye instead of ten, and twelve supralabials instead of nine or ten. But one of my specimens from Southern Persia agrees in these characters with Egyptian examples. The number of scales round the middle of the body in the specimens examined by Jan was forty-five. In the specimen from Saidabád the series are forty-seven to fifty round the middle of the body, in that from between Karmán and Shiráz forty-four to forty-seven, in that from Kohrúd forty-seven is also the highest number. In the specimen from Krasnovodsk I count fifty. In all cases the largest number is to be found about half-way from the head to the tail, the number diminishing both in front and behind.

In two of the specimens the nostril is between three scales, an anterior and a posterior nasal and an anterior frontal. In the Kohrúd specimen these three plates are united above the nostril, but the two lower are separated below.

The number of ventral and subcaudal shields and the total length in the three specimens respectively are:—

	ventrals.	subcaudals.	length. in.	tail. in.
No. 1.	180	29	13	1.55
2.	189	34	8.5	1
3.	180	20	17.5	1.5

Colour pale brown, with irregular spots, largest along the middle of the back, smaller on the sides, and chiefly composed of blackish longitudinal lines along the edges of the scales.

This does not appear to be a very common snake in Persia. One specimen brought to me was found in a stable. The pupil is vertical, and the animal nocturnal in its habits.

Eryx elegans[1] (Gray), from Afghánistán (*Cursoria elegans*, Gray, Cat. Sn. Brit. Mus. pp. 84, 107, and Günther, Rept. Brit. Ind. p. 333), may probably be found in North-eastern Persia. The type specimen in the British Museum continues to be unique, and I was at first disposed to look upon it as possibly a variety of the present species; but the scales on the body are much larger, being in only thirty-five or thirty-six rows round the middle, and the muzzle is blunter. I was inclined to doubt whether the latter difference might not be due to injury or contraction, as the specimen is much dried; but Dr. Günther thinks not, and he is most likely to be correct, from his long experience of museum specimens. The tail scales appear smooth, but most of them are decorticated, and in that state the scales of *E. jaculus* also lose all convexity or carination, whilst a few in *E. elegans*, which retain the epidermis, appear to me slightly convex, and in any case, as I have shown, this character is variable, so that I have no hesitation in placing *E. elegans* in the same genus as *E. jaculus*, although it appears to be a distinct species. It certainly differs no more from *E. jaculus* than the latter does from *E. Johnii*.

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[1] The following was written before I saw Dr. Strauch's recently published 'Schlangen des Russischen Reichs,' in which, p. 34, note 7, he comes to the same conclusions respecting *Cursoria elegans*, and on precisely the same grounds.

Of the family *Calamaridæ* I cannot ascertain that any form has as yet been met with in Persia. In the Catalogue of the Colubrine Snakes in the British Museum, p. 61, a specimen of *Calamaria coronella*, Schlegel, is quoted from that country, but Dr. Günther informs me that he has since ascertained that this is a mistake, the specimen being really American.

FAMILY COLUBRIDÆ.

62. **Cyclophis modestus**, (Martin).

Coronella modesta, Martin, P. Z. S. 1838, p. 82.
Ablabes modestus, Günther, Cat. Col. Sn. Brit. Mus. p. 27.—P. Z. S. 1864, p. 489.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 36, Pl. I, fig. 1.
Eirenis collaris, Jan, partim, Archiv. p. la Zool. Genova, ii, p. 256; ? Icon. Oph. livr. 15, Pl. IV, fig. 1, 2.

1.	Kohrúd, north of Isfahán	8000
2.	Lura valley, north of Tehrán, Elburz mountains ..	6000

It appears to me that the most important distinction between the genera *Ablabes* and *Cyclophis* consists in the presence of two nasal shields in the former and only one in the latter. The genus *Eirenis* of Jan was proposed for species of *Ablabes* with united nasals, and it is consequently identical with *Cyclophis*.

The following is a description of the Persian specimens, which differ but little from each other. Head distinct from trunk, rather depressed; snout short, rounded; body cylindrical, moderately stout; tail of moderate length. Scales smooth, in seventeen longitudinal rows. Ventrals 168 in one, 156 in the other specimen; anal divided; subcaudals in sixty-four to sixty-eight pairs. In one specimen the shield before the anal is divided, and the second and third pairs of subcaudals are united. Length of the Kohrúd specimen 20 in., of which the tail measures 4.5; of the Karij specimen the whole length is 21 in., tail 5.5. Both are males.

The rostral is broader than high, just reaching the upper surface of the head. Præfrontals quite as long as the postfrontals, and about two-thirds their breadth, the median suture of both rather oblique. Vertical square in front, its lateral margins very slightly converging behind. Occipitals rather broad in front and in contact with both postoculars. slightly rounded behind; they are about one-third longer than the vertical. Nasals about twice as long as high, and higher in front than behind, the nostril in their centre. Loreal small, square. One præocular, which just reaches the upper surface of the head, but is widely separated from the vertical; two postoculars equal to each other. Temporals 1 + 2 + 3. Supralabials seven, the third and fourth entering the orbit; eight infralabials. Two elongate pairs of chin shields, the first twice the length of the hinder pair, and in contact with four or five pairs of infralabials. Pupil round. Teeth small and equal.

Colour grey with an olive tinge when living, greyish brown in spirit. A few faint darker spots forming imperfect transverse bands on the back. No trace of a collar. Lower parts yellowish white.

The type of *Coronella modesta*, Martin, was brought from the Euphrates valley. This species has also been found in Palestine (Günther, P. Z. S. 1864, p. 489), Syria, Transcaucasia, and the neighbouring countries.

Tyria argonauta, Eichwald, Bull. Soc. Nat. Mosc. 1839, ii, p. 306, and Fauna Casp.-Cauc. p. 114, Pl. XXVI, fig. 1, 2, is referred to the present species by Günther, Jan, and Strauch, but it appears to be distinguished by having two præoculars. Jan, who unites *Ablabes decemlineatus*, Dum. et Bibr., and forms belonging to the present species with *Coluber collaris*, Mén., states that the præocular is sometimes single, sometimes double, but it is not clear whether his remark on this subject is not due to his having confounded more than one species. Strauch, l. c., a far higher authority, appears to me only to have had before him specimens of Eichwald's species, for although he says that some of his specimens have the præocular partly, others entirely divided, none have it simple, as it appears always to be in the true *Cyclophis modestus*, and I think specimens should be compared before uniting the two forms. If Strauch is correct in uniting them, the specific name of *modestus* must apparently give way to that of *nigricollis*, bestowed by a Russian naturalist named Dwigubsky in 1832, although Strauch does not use the latter name. Dwigubsky, as stated by Strauch, never saw the species himself, and merely gave Latin names to descriptions by Hohenacker in the Bulletin de Moscou; but if this were an objection, few if any of Gmelin's names would stand. Moreover, the species was so poorly described by Hohenacker that it could not be recognised but for Strauch's identification of the types, which were received from Hohenacker by the St. Petersburg Museum. Unfortunately the same remark *mutatis mutandis* precisely applies to *Coronella modesta* of Martin; the description is insufficient, and the species is only known from the type having been made over to the British Museum.

63. * C. collaris (Mén.)—De F.

Coluber collaris, Ménétries, Cat. Rais. No. 228, p. 67.
Eirenis collaris (Mén.), apud De F. Viag. in Persia, p. 355, nec Jan.
Ablabes collaris, Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 41, Pl. I, fig. 2.

Until the appearance of Strauch's account of the Russian snakes, it was very difficult to identify this species, especially as Ménétries described it as having an undivided anal. The original specimen of Ménétries exists in the St. Petersburg Museum, and Strauch's description taken from it and from other Transcaucasian specimens enables me to refer to this species two snakes collected by the Marquis Doria in Tehrán, and now in the Museo Civico at Genoa. These differ from *C. modestus* in having only fifteen rows of scales, and in the two pairs of chin shields being equal to each other, as they are in *C. decemlineatus*. The following is a description taken from the specimens.

Scales smooth, in fifteen very regular longitudinal rows without any apical groove. Body and tail moderate; head scarcely distinct from neck.

Nasal shield single. Loreal present, small and square. One anterior, two posterior oculars. Rostral very little broader than high. All the frontals broader than long, and rather pointed exteriorly; the anterior subtriangular, about half the size of the posterior. Vertical nearly square in front, sides straight and parallel for some distance back, then converging with a curve. Superciliaries nearly as broad in front as behind. Occipitals comparatively large, nearly twice as long as the vertical, slightly rounded behind. One præocular not extending to the upper surface of the head; two postoculars nearly equal to each other. Temporals 1 + 2. Seven upper labials, the third and fourth enter the orbit. Eight lower labials. Two pairs of subequal chin shields, neither very elongate, the anterior each in contact with four, the posterior with two lower labials. Ventrals 174 and 171; anal divided; subcaudals in 55 and 54 pairs.

Colour in spirits nearly uniform grey; a black half-collar three or four scales broad on the nape, interrupted beneath, commencing just behind the occipitals. In one specimen there is a black band between the eyes, and a line from the end of it running inward and backward on to the occipitals. This band is but faintly indicated on the other specimen.

64. C. **fasciatus** (Jan).

Eirenis fasciatus, Jan, Archiv. p. la Zool. Genova, ii, p. 260.—Icon. Oph. livr. xv, Pl. V, fig. 2.

1. Dehgirdú, about half-way between Shiráz and Isfahán	8000

This specimen agrees excellently in colour with the description and figure of Jan's type from Palestine. The only differences in the head shields are that the præfrontals in the Persian form are of the same length as the postfrontals, whereas in the 'Iconographie des Ophidiens' the former are represented as shorter; and in the specimen collected by me the occipitals are much broader in front, coming down so far as to touch both postoculars. The anterior temporal is consequently elongate and narrow, and only in contact with the lower postocular. In Jan's figure the anterior temporal is represented as much broader and in contact with both postoculars, whilst the occipital only reaches the upper one. The scales are represented as minutely puncticulate in *C. fasciatus*, which they are not in my specimen.

The following is a description of the Persian specimen. Head short, depressed, rather broader than the neck; snout short, rounded. Body cylindrical, rather stout. Scales smooth, diamond-shaped, but with the terminal points truncated or rounded, in fifteen rows. Ventrals 158; anal divided; subcaudals in 63 pairs (the second, third, and fourth behind the anus undivided in the specimen obtained). There are about ten short equal teeth on each side of the upper jaw and of the palate. Length 13.5 in., of which the tail measures 3.25.

Head plates:—Rostral broader than high. Anterior frontals of equal length with the postfrontals, and rather more than half as large; the sutures of both pairs of frontals oblique. Vertical pentagonal, square in front, lateral margins straight and parallel. Superciliaries about equally broad before and behind. Occipitals about 1½ times as long as the vertical, rather broad in front, and in contact with both postoculars, slightly rounded behind. Nasal nearly twice as long as it is high, with the nostril in the centre. A small square loreal, much less in height than the nasal. One præocular, not reaching the top of the head. Two postoculars of equal size. Temporals 1 + 2, the first an elongate shield, only touching the lower portion of the lower postocular in front. Eye moderately large, pupil circular. Seven upper labials, the third and fourth enter the orbit; seven lower labials. Two pairs of elongate chin shields, the anterior in contact with four infralabials, the second, about half the length of the anterior, in contact with the fourth and fifth.

Colour (noted when fresh) sandy grey, with numerous narrow slightly waved cross-bands of brownish olive on the back, breaking into spots on the sides and tail. Belly salmon colour; the anterior portion of each ventral shield brown near the sides. Head above sandy, with small rather diffused spots of brown; labials white, the hinder edges of the upper labials brown.

The only specimen obtained was found amongst stones on a dry barren hill-side, at an elevation of 8000 feet above the sea, at Dehgirdú, about half-way between Shiráz and Isfahán on the summer route. Like most of the *Coronellinæ*, it was very gentle, not attempting to bite when handled.

65. ***C. frenatus**, Günther.

Cat. Colubr. Sn. Brit. Mus. p. 120.—Rept. Brit. Ind. p. 230, Pl. XIX, fig. 1.

The type of this species was said to be from Afghánistán. A specimen now in the British Museum was obtained by Captain Jones in Mesopotamia, so there can be little or no doubt of its occurrence in Persia. It is somewhat startling to learn that it also occurs in the Khasi Hills in North-eastern India, a locality with a fauna differing in every respect from that of Afghánistán and Persia, but there is a specimen in the British Museum brought by Dr. Jerdon. I confess that even on such high authority I have much difficulty in believing that this snake is found in both localities.

C. frenatus has fifteen rows of scales round the body, ventrals 165, subcaudals in 95 pairs. There is a small square loreal, one præ- and two post-oculars. The vertical is broad in front, the lateral margins converging much behind. Seven upper labials, the third and fourth entering the orbit; temporals large, 1 + 2. The head is rather broad and short, distinct from the neck. The body and head are uniform olive above, yellowish below; three black stripes from the side of the head down the anterior portion of each side, one from the eye, another from the throat along the edges of the ventral plates, the third intermediate.

66. **C. Persicus**, Anderson, Pl. XXVIII, figs. 1, 1 a, 1 b.

P. Z. S. 1872, p. 392, fig. 8.

1. Niríz, east of Shiráz 5000

C. *corpore elongato, scutis ventralibus* 194–216, *squamis corporis in* 15 *series longitudinales dispositis, scuto loreali nullo, præoculari uno, postoculari quoque unico; verticali pentagonali, lateribus parallelis; capite colloque supra nigris, corpore pallide olivaceo, subtus pallidiore.*

Hab. in Persiâ meridionali. Specimen typicum a Bushire allatum fuisse dicitur.

Owing to a very serious misprint in the description of this species in the Proceedings of the Zoological Society, by which the number of ventral shields was given as 144, instead of 194, and also to the head of the only specimen obtained by me being narrower than that of Dr. Anderson's type, I supposed that the two specimens represented distinct species until I compared them. There are one or two other misprints or slight mistakes in the description of *C. Persicus*, due to the paper having been printed in the author's absence, and I therefore give a fresh description.

Description:—Head rather short, broader than the neck in the type, though scarcely so in the Niríz specimen; snout depressed, obtuse; body cylindrical, slender; tail moderate. Scales of the body smooth, rather short, rhomboidal with slightly blunted apex and no apical groove, in fifteen rows. Ventrals 194–216, not angulate at the sides; anal divided; subcaudals in 74 to 77 pairs, the third pair behind the anus undivided in one specimen. Isodont, there being about twelve or fourteen short equal teeth on each side of the upper jaw; palatine teeth small, equal. Length of one specimen 13.5 in., the tail being rather more than 3; of the other, 16 in., of which the tail is 3.5.

Head plates:—Rostral shield very low, just reaching to the upper surface of the head. Anterior frontals rather broader than long, very little inferior in size to the postfrontals, which are the same length but much broader, extending to the side of the head, and nearly touching the second labial on each side. Vertical nearly twice as long as broad, with a very obtuse angle in front; lateral margins parallel, hinder margins slightly rounded. Superciliaries as broad behind as in front; occipitals rather broad in front, extending to the side of the head behind part of the postocular, rounded behind. Nasal shield long, triangular, highest in front, pointed behind, only just touching the præocular; the nostril is situated about the middle of the shield. No loreal. One præ- and one post-ocular, both of moderate size, neither extending to the upper surface of the head. Temporals 1 + 1. Upper labials seven; the third and fourth enter the orbit; seven lower labials. Two pairs of elongate chin shields, the first in contact with four lower labials, the second with one; the second about half the size of the first.

Colour (noted when fresh):—Head and anterior portion of neck above black, this colour coming down the sides of the neck to below the gape; lower portion of the upper labials white; black patches on the anterior lower labials. The remainder of the body is pale olive, rather lighter below than above. In the type specimen described by Dr. Anderson the black of the head is divided by a pale transverse band across the occipitals (fig. 1 b).

This species agrees with *C. calamaria*, Günther, and *C. nasalis*, Günther, in having no separate loreal; but it is easily distinguished from both of them by having only one postocular, and by the much larger number of ventral shields. I am not quite sure that it ought not to be separated from *Cyclophis* as a distinct genus on account of its elongate form, but as similar variation exists in the allied genus *Ablabes*, in one species of which, *A. Humberti*, I have found the ventral shields vary from 155 to 240 (Proc. As. Soc. Bengal, 1871, p. 174), I hesitate to propose a new generic name for it. In its slender form it approaches *Homalosoma*.

The figures in the plate are of the natural size. Fig. 1 represents the specimen from Niríz, 1 a being the head with the colouration omitted to show the form of the head shields; 1 b is the head of the typical specimen described by Dr. Anderson.

67. *Coronella austriaca, Laur.

Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 43.
Coluber nebulosus, Mén. Cat. Rais. No. 239, p. 73.
Zacholis lævis, Eichwald, Fauna Casp.-Cauc. p. 118.
Coronella austriaca, var. *Caucasica*, Jan, Archiv. p. l. Zool. Genova, ii, p. 250.

The type of Ménétries's *Coluber nebulosus*, which Strauch has identified with *Coronella austriaca*, was obtained from the Tálish mountains, within the Persian boundary. The species has not hitherto been found elsewhere in Persia, but it is common in the Caucasus and in Georgia.

The above are the only species of colubrine snakes belonging to the *Coronella* group which have, so far as I know, actually been found in Persia. Two other species were described by Martin from the collections brought back by the Euphrates expedition, under the names of *Coronella multicincta* and *C. pulchra*, (P. Z. S. 1838, p. 82). As however only the colours were described, and the types do not appear, as in the case of *Coronella modesta*, to have been preserved in the British Museum, it is impossible to identify these species.

68. *Sphalerosophis microlepis, Jan.—De F.

Sphalerosophis microlepis, Jan, De F. Viag. in Persia, p. 356.
Loxodon[1] *microlepis*, Jan, Icon. Oph. livr. 20, Pl. III.

Of this very interesting form the original specimen was obtained by the Marquis Doria in Láristán, on his journey from Bandar Abbás to Shiráz. It could not be found when I was in Turin, so that I have had no opportunity of examining it, and I am only acquainted with it from the description and the figure quoted above. Judging from the latter, it appears to approach in character to *Zamenis diadema*. The following is a translation of Professor Jan's description: (I employ Günther's names for the head shields, as I have done throughout, instead of Duméril and Bibron's, which Jan uses).

'*Sphalerosophis*, n. gen. Belongs to the family of the *Colubridæ* and has somewhat the appearance of *Periops*, but is distinguished by the following generic characters. Anterior portion of the head covered above by twenty to twenty-five small irregular shields in the place of the præ- and post-frontals; behind these are a vertical, two superciliaries, and two occipitals. Eye entirely surrounded by ten to thirteen small shields of various shapes, which separate it entirely from the labials. Rostral truncate at the apex, with six well-marked angles. Nasal divided. Loreal and temporals replaced by small and numerous scales. Upper labials fourteen or fifteen, lower fifteen to seventeen. Two pairs of chin shields. Scales of the body small, smooth, convex, arranged in forty-one to forty-three longitudinal series. Anal entire. Subcaudals double. Teeth of the upper jaw smooth, equal in size, without interval.'

'*Sphalerosophis microlepis*, Jan. Ground colour that of the chamois (or rather of *café au lait*). Above there are blackish rectangular spots, narrow and transverse to the back, flanked by others, longitudinal near the neck, farther back smaller, subquadrate and alternating; a black stripe runs from the eyes and is prolonged to behind the mouth. Below the colour is yellowish, without spots.'

'The specimen obtained by Doria in Láristán measures 4 ft., head

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[1] *Loxodon* appears to be a generic name invented by Professor Jan for this species because *Sphalerosophis* had been objected to. But *Loxodon* having been already applied by Falconer to a genus of elephants, cannot be used for this snake. On the cover of the 'livraison' the generic name is printed Toxodon.

1.5 in., tail 9½ in. Behind four or five pairs of gular scales there are 263 ventral and 100 double subcaudal shields.'

'Another individual belonging to the Milan Museum, and apparently coming from Shiráz, is 28 in. long and the tail 6 in. It is in all respects similar to the first.'

It appears to me that this form is simply a *Zamenis* (or *Periops*) in which the division of the head scales has been carried farther than in *Z. diadema* and its allies. It resembles those species in its undivided anal and in its colouration. One character not mentioned in the preceding description, but shown in Jan's plate, consists in the presence of two small pores at the apex of each scale.

69. **Zamenis diadema** (Schl.), var.—De F.

Coluber diadema, Schlegel, Essai Phys. Serp. ii, p. 148.
Zamenis diadema, Günther, Rept. Brit. Ind. p. 252.—Anderson, P. Z. S. 1871, p. 174.—Stol. Proc. As. Soc. Bengal, 1872, p. 82.
Periops parallelus, Geoff., var. *Schiraziana*, Jan, De F. Viag. in Persia, p. 356.—Jan, Icon. Oph. livr. 20, Pl. II.
Z. Cliffordii, Anderson, P. Z. S. 1872, p. 393.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 105.

1.	Samán, Dasht, Balúchistán	—
2.	Zamrán, Balúchistán	2500
3.	Dizak, Balúchistán	4000
4.	East of Bampúr, Balúchistán	2500
5, 6.	Karmán, south-eastern Persia	5000
7-11.	Between Karmán and Shiráz	—

I must confess feeling much doubt as to whether this species and its ally or variety *Z. Cliffordi* (Schl.) should not be separated from *Zamenis* and placed in the genus *Periops* of Wagler, a genus admitted by Duméril and Bibron, though not by Günther, doubtless because of the difficulty of deciding to which generic group *Coluber hippocrepis*, L., the type of *Periops*, should be assigned. The circle of small plates round the eye, to which the genus owes its name, is occasionally found, as I shall show, in *Zamenis ventrimaculatus*. There is a specimen of *Z. hippocrepis* in the British Museum with an undivided anal, as in *Z. Cliffordi* and *Z. diadema*, but this plate is usually bifid in the first-named species, as in typical *Zamenis*. Similarly as regards dentition, the number of scales round the body, and other characters, *Z. hippocrepis* is in some respects allied to *Z. Cliffordi*, in others to typical *Zamenis*. On the other hand, it is difficult to class *Z. diadema*, one of the gentlest of snakes, in a genus which derives its name from its ferocity.

I find it almost equally difficult to decide whether *Z. Cliffordi* (Schl.), the African form, should be united to the Asiatic *Z. diadema* (Schl.)[1], or whether the two should be kept distinct. Günther, in his 'Reptiles of British India,' distinguishes the Indian form because of its having supplementary shields behind the frontals and of its ventrals being keeled. Both these characters are liable to variation. I have one specimen from near Karmán, in which the post-frontals are in contact with the vertical, as in *Z. Cliffordi*, and in scarcely any of the Persian examples is there more than slight angulation of the ventral shields, while even this appears to be wanting in adults. But I have kept the two races distinct, although there are evidently intermediate forms, precisely on the same principle on which I have kept *Sylvia Jerdoni* separate from *S. orphea;* the Eastern race being distinguished by constant characters, although the two forms blend where they meet. This is a different case from that of *Zamenis ventrimaculatus, florulentus*, and *rhodorachis*, amongst which all the forms appear to have nearly an equal range.

If the presence of four supplementary shields behind the post-frontals be a constant character in the Indian form, the Persian race might be distinguished, for in the latter there are almost as constantly three, as shown in all my specimens except two, one of which, as already mentioned, agrees with *Z. Cliffordi*, and in the other, a large snake, the central supplementary shield is irregularly divided, not equally, as in the Indian *Z. diadema*. Jan also states that several specimens examined by him had three scales behind the frontals. In a snake, however, which shows so much variation, and in which so many of the head shields are liable to division, the circumstance of the central supplementary frontal being single or double can scarcely be thought of sufficient importance for specific distinction, although each variety seems remarkably constant locally.

The number of ventral scales appears about the same as given by Günther for *Z. diadema*, or about 240, but the subcaudals are in only eighty-four to eighty-seven pairs in several specimens in which I have counted them, instead of 100 as in the Indian *Z. diadema*; and in one large specimen from Karmán there are only sixty-six pairs.

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[1] If they are united, the specific name *diadema* should have precedence, being employed by Schlegel on p. 148, vol. ii, of the 'Essai,' whilst *Coluber Cliffordii* is not described before p. 163.

The keels on the scales of the hinder part of the body are very often faint or entirely wanting, in young specimens at all events. The largest specimen obtained, however, shows them distinctly. This specimen is four feet long; the snake doubtless grows to a larger size.

I have never seen in Persia the rich red colouration described by Stoliczka as exhibited by males of the Indian variety. Young Persian specimens show very distinctly the colouration figured by Jan, and the following description was taken from a fresh specimen. Colour above sandy, with rather pale olive spots; of these there is a row of peculiar shape, something like a 'spread eagle,' down the middle of the back, and smaller spots on the sides. On the head is a broad olive band between the eyes, the rest of the upper part of the head is more or less mottled with olive, and there is a spot on each occipital; a dark line runs back from the eye to the gape, and the posterior edge of the upper labials are olive. Lower parts whitish.

I found this rather handsome snake common in Balúchistán and Southern Persia. It inhabits barren plains and hill sides, living, I expect, in great measure upon insects. It is very gentle, never attempting to bite, so far as I have seen, and I have had many in my hands alive. At Genoa are specimens obtained by Doria at Tehrán, so this species is doubtless found throughout Persia, and Strauch records its occurrence on the eastern shore of the Caspian Sea.

70. **Z. ventrimaculatus**, (Gray).—De F.

Coluber ventrimaculatus, Gray, Ind. Zool. ii, Pl. LXXX, fig. 1 (1834).
C. florulentus, Schlegel, Phys. des Serp. ii, p. 166 (1837).
C. Chesnei, Martin, P. Z. S. 1838, p. 81.
C. (*Tyria*) *Karelinii*, Brandt, Bull. Acad. St. Pet. iii, p. 243 (1838).
Zamenis florulentus, Dum. et Bibr. Erp. Gén. vii, p. 693.
Z. ventrimaculatus, Günther, Cat. Col. Sn. Brit. Mus. p 105; Rept. Brit. Ind. p. 253.
Z. rhodorachis, Jan, De F. Viag. in Persia, p. 356.
Z. Persicus, Jan, Icon. Oph. livr. 23, Pl. II, fig. 1.—Anderson, P. Z. S. 1872, p. 393.
Z. ladacensis, Anderson, Jour. As. Soc. Bengal, 1871, xl, Pt. 2, p. 16.
Gonyosoma dorsale, Anderson, P. Z. S. 1872, p. 395, fig. 9.
Zamenis Karelinii, Strauch, Mem. Acad. St. Pet. xxi, No. 4, p. 110, Pl. III.

1.	Húng, Balúchistán	2500
2, 3.	Zamrán, Balúchistán	2500
4.	Askán, Balúchistán	3000
5.	Kalagán, Balúchistán	3500
6, 7.	South of Rigán, Narmashir, south-eastern Persia	3000
8–10.	Karmán	5000
11.	Southern Persia (? near Shiráz)	—
12.	Cape Massandim, Arabian coast, entrance to Persian Gulf	—

I agree with Dr. Günther, to whom I am indebted for several of the preceding identifications, and especially that of *Gonyosoma dorsale*[1], in uniting all the supposed species above enumerated. This *Zamenis* is very variable, both in colour and in the characters of the head shields. There are three well-marked forms found in the Persian area, all of which were described by Günther in his 'Catalogue of Colubrine Snakes,' l. c.

Var. A. of Günther, the type of Dr. Gray's species, is a pale-coloured snake with black marks more or less developed on the back and head, and a black cross-band between the eyes, running back between the occipital shields and continued below the eyes on the labials. There is also a black temple streak. This, with the black marks rather more developed, is *Coluber Chesnei*, Martin, *Zamenis Ladacensis*, Anderson, and *Zamenis Persicus*, Jan, the figure of the last of which in the 'Iconographie des Ophidiens' might almost have been taken from the type of *Coluber Chesnei* in the British Museum. *Coluber Chesnei* was brought from the Euphrates valley, and there are specimens in the British Museum closely resembling it from Bushire, whilst Anderson received specimens from Shiráz. I did not meet with this variety in Balúchistán or Persia, but a young specimen was captured by Major Euan Smith at Kila-i-Fath, Sístán, which wants the transverse mark on the head. This individual, however, is chiefly curious from having all the labials below the eye divided[2], so that none of them enter the orbit, and the eye is surrounded below with small shields as in *Z. hippocrepis*, *Z. Cliffordii*, etc. The ventrals are 218 in number, subcaudals 108.

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[1] Since the above was written I have been able to examine the type of this species. It was rightly identified.

[2] It appears to agree, both in colouration and the circumstance of having the eye surrounded by small shields below, with two specimens described by Strauch as varieties of *Zamenis Karelinii*, Brandt, Mem. Acad. St. Pet. xxi, No. 4, p. 113.

Var. B. of Günther, with black-edged ocelli, is not, so far as I know, found in Persia; but var. C., 'Olive, without cross-bands, a broad rose-coloured band along the whole back,' is the type of Jan's *Z. rhodorachis* and of Anderson's *Gonyosoma dorsale*. Jan says that it is distinguished by having only nineteen rows of scales, whereas *Z. florulentus* (*ventrimaculatus*) has twenty-one, but he is in error; the latter species has usually only nineteen rows, and in two specimens in the British Museum, from Egypt, with the colouring of *Z. rhodorachis*, one has nineteen, the other twenty-one rows.

This form passes into another, to which some of the specimens collected by me belong, without the rose-coloured stripe down the back, but also without any indication of cross-bands. An individual of this variety brought from Shiráz exists in the Museo Civico of Genoa, and was identified by Jan with his *Z. rhodorachis*. This colouration again passes into the common Persian form, which is allied to Günther's var. D. It is pale greyish-drab in colour, with darker cross-bands of varying breadth, often breaking up into spots, and with dusky or grey spots along the edges of the ventral shields. The head is uniformly coloured above, the lower parts pale.

Of these different forms the most distinct is var. A., the true *Zamenis ventrimaculatus*, but all have the same peculiarly formed occipital shields, abruptly truncated behind[1], and nine upper labials, of which usually the fifth and sixth enter the orbit. In three of my specimens, however, two from Karmán and one from Zamrán in Balúchistán, the sixth supralabial is divided, so that there are three postoculars, and only the fifth supralabial enters the orbit. This form is *Zamenis Karelinii* (Brandt), but as the division of plates, and especially of the supralabials, is so common as almost to be characteristic of the genus *Zamenis*, I do not think the distinction specific. For if it be, why should not the variety already mentioned from Sístán, in which none of the supralabials enters the orbit, also be distinguished? In all the forms of this snake the markings of the side of the head are similar, the præ- and post-oculars being pale, and a spot under the eye and the hinder supralabials with the temporal region dark coloured. The pupil is slightly elliptical horizontally, but becomes circular in spirit.

This is one of the commonest Persian snakes, and occurs throughout the whole country, both in the highlands and lowlands, being found in semi-desert plains and on stony hill-sides. So far as I have seen, it exhibits little or none of the ferocity characteristic of some species of *Zamenis.*

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[1] I have in no case found the larger rounded scales mentioned by Günther as occurring behind the occipitals.

71. ***Zamenis Caspius** (Iwan).—De F.

Coluber Caspius, Iwan, Voy. en Russ. i, p. 317, Pl. XXI (1769), teste Strauch.
C. atrovirens, Shaw, Zool. iii, p. 449.
Hæmorrhois trabalis, Boie, Eichw. Faun. Casp.-Cauc. p. 113.
Zamenis viridiflavus, Dum. et Bibr. Erp. Gén. vii, p. 686. — De F. Viag. in Persia, p. 350.
Z. trabalis, Dum. et Bibr. l. c. p. 689. — Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 116.
Z. atrovirens, Günther, Cat. Col. Sn. Brit. Mus. p. 101.

I did not obtain this species. There are two specimens in the museum at Genoa, collected by the Marquis G. Doria. One of these is from Tehrán, and has the colouration of European specimens (*Z. atrovirens*, var. *viridiflavus*). The other is from Hamadán, and is of a bluish grey colour, with numerous small black spots much broken up by the general ground colour. This appears to approach the form distinguished by some authors as *Zamenis Caspius*, var. *trabalis* (*Hæmorrhois trabalis* of Boie and Eichwald).

72. ***Z. Dahlii** (Fitz.)—De F.

Coluber ocellata, Mén. Cat. Rais. p. 70.
Tyria najadum, Eichwald, Fauna Casp.-Cauc. p. 115, Pl. XXVII, fig. 1, 2.
Zamenis Dahlii, Dum. et Bibr. Erp. Gén. vii, p. 692.—Günther, Cat. Col. Sn. Brit. Mus. p. 107.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 123.
Tyria Dahlii, De F. Viag. in Persia, p. 355.

This snake also escaped my researches. It was obtained at Isfahán by Doria, the specimen being preserved at Genoa, and two specimens were in Aucher-Eloy's collection. Eichwald and Ménétries state that it is found in the Tálish mountains near the Caspian.

73. **Z. Ravergieri**, (Ménétries).—De F.

Coluber maculatus[1], Dwigubsky (1832).
C. Ravergieri, Mén. Cat. Rais. p. 69, No. 235 (1832).

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[1] This name cannot be adopted because there is a previous *Coluber maculatus* of Merrem. The quotation of Dwigubsky's name is of course taken from Strauch's Memoir 'On the Snakes of Russia.'

Zamenis caudalineatus, Günther, Cat. Col. Sn. Brit. Mus. p. 104.—Jan, Icon. Oph. livr. 23, Pl. III.
Periops caudalineatus, Jan.—De F. Viag. in Persia, p. 255.
Zamenis Ravergieri, Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 128.
Z. Fedtschenkoi, Strauch, ib. p. 135, Pl. IV.

1.	Karmán	5000
2.	Between Karmán and Shiráz	—
3–5.	Southern Persia, near Shiráz	4000–6000
6, 7.	Kohrúd, north of Isfahán	7000

Jan, in his notes on De Filippi's snakes, places this species in *Periops* with *Z. hippocrepis* and *Z. Cliffordii*, but in his 'Iconographie' he restores it to *Zamenis*. I should have thought that if it be removed from *Zamenis* it should be placed in *Tropidonotus*, from which genus it is only distinguished by its more numerous ventral shields and the tendency to division in some of its labials, for some *Tropidonoti* have the same dentition as *Zamenis*.

The scales are usually smooth in the anterior portion of the body, keeled behind. The number of rows of scales is normally twenty-one, but not unfrequently twenty-three in parts of the body, and less commonly nineteen. There is usually a small shield below the loreal, and in one specimen two are present. The colouration is very constant, but in two specimens, from Shiráz and Kohrúd, the tail is spotted as well as the body; not streaked. This is the form called *Z. Fedtschenkoi* by Strauch, my specimens being somewhat intermediate in colouration between Strauch's species, which he considers as probably only a variety, and the true *Z. Ravergieri*, and proving clearly that the two pass into each other.

I have no notes of the habits of this species. All the specimens obtained were, I believe, brought to me.

Z. Ravergieri appears to be found throughout the Persian plateau, for besides the localities quoted it has been found at Tehrán by Doria, and at Sháhrúd, south of Astrabád, by Christoph (Strauch, l. c.). In the British Museum are specimens from Shiráz and Kúrdistán. Outside of Persia it has been found in Transcaucasia, in Palestine, and in some of the countries to the east of the Caspian.

74. **Tropidonotus natrix** (L.)

Dum. et Bibr. Erp. Gén. vii, p. 533.—Günther, Cat. Col. Sn. Brit. Mus. p. 61. —Anderson, P. Z. S. 1872, p. 393.

Coluber natrix, scutatus, Persa et *minutus*, Pall. Zoog. Ros. As. iii, pp. 35—41.
T. Persa, natrix, ater et *scutatus*, Eichwald, Fauna Casp.-Cauc. pp. 105-109, Pl. XXI, XXII, XXIII.

1, 2. Enzeli, in Ghilán, on the Caspian Sea.

The two specimens obtained agree very well in colouration with the description given by Eichwald of *T. scutatus*, which, as he remarks, is merely a black variety of *T. natrix*. The plate labelled *T. scutatus* represents however, as is stated by Eichwald, another variety with which he identifies *T. elaphoides*, Brandt. Anderson describes specimens somewhat similarly coloured, which were collected at Resht. Those which I obtained were brought to me with others of *T. hydrus*, and I believe the two live together in the creeks around the great marsh called the Mardáb, between Resht and Enzeli. Eichwald describes *T. scutatus* as living thus near Astrabád.

Hitherto, so far as I am aware, *T. natrix* has only been found in Persia in the Caspian provinces.

75. **T. hydrus** (Pall.)—De F.

Eichwald, Fauna Casp.-Cauc. p. 110, Pl. XXIV.—Dum. et Bibr. Erp. Gén. vii, p. 564.—Günther, Cat. Col. Sn. Brit. Mus. p. 63.—De F. Viag. in Pers. p. 357.—Anderson, P. Z. S. 1872, p. 394.
Coluber reticulatus, Ménétries, Cat. Rais. p. 71.

1. Tang-i-Kerím, near Niríz, east of Shiráz	5000
2, 3. Anán, Mazandarán, in the Elburz mountains, north of Tehrán	7000
4-8. Enzeli, in Ghílán, on the Caspian Sea	—

All the Persian specimens collected by me, except one, have three præoculars and four postoculars, the exception has two præoculars and five postoculars on one side, four on the other. The lowest postocular varies much in size, being sometimes very minute. In one specimen the third supralabial is divided into two.

This snake is common in the marshes and streams of the Persian highlands, and is peculiarly abundant in the creeks about Resht and Enzeli, near the Caspian. Wherever I have met with it, it lives in the water.

76. * Coluber longissimus (Laurenti).

Zamenis Aesculapii, Eichwald, Fauna Casp.-Cauc. p. 119.
Coluber Aesculapii, Strauch, Mém. Acad. Sci. St. Pét. xxi, No. 4, p. 57, nec L.

C. Aesculapii, L., being a different species, the name cannot be employed for this snake, although used by Duméril and Bibron, Günther, and others. According to Strauch, this snake has been found at Lankorán by Radde.

C. Hohenackeri, Strauch (*C. rubriventer*, Dwigubsky), has been described from the Transcaucasian provinces. It is said to differ from *C. longissimus* in the number of lower labials, in the ventrals not being keeled, and in colouration. Like other Transcaucasian forms, it probably extends into Persia.

77. * ? Elaphis dione (Pall.)

Dum. et Bibr. Erp. Gén. vii, p. 248.—Günther, Cat. Col. Sn. Brit. Mus. p. 92.
Coluber Dione, Pall. It. ii, p. 717; Zoog. Ros. As. iii. p. 39.
Calopeltis Dione, Eichwald, Fauna Casp.-Cauc. p. 120, Pl. XXVIII.

This snake is said by Pallas to have been sent from Persia by Gmelin, and as it inhabits the countries both east and west of the Caspian, it may probably be found within our limits. Strauch says it is rare in Transcaucasia, and that it was only obtained by Ménétries from the Mogan steppe, between Bákú and Salian, and he suggests the possibility of Gmelin's having procured it in the same country, which does not now belong to Persia, although it did so in Gmelin's time, a century ago.

Elaphis Sauromates, Pallas (*Tropidonotus Sauromates*, Eichwald, Fauna Casp.-Cauc. p. 111, pl. XXV) is said by Eichwald and Strauch to be found throughout the Caucasus and Transcaucasia. It also extends east of the Caspian Sea, and may very possibly inhabit parts of Northern Persia.

FAMILY PSAMMOPHIDÆ.

78. **Psammophis Leithi**, Günther.

P. Z. S. 1869, p. 505.—Stoliczka, Proc. A. S. B. 1872, p. 83.

1.	Píshín, Balúchistán	800
2.	Húng, Balúchistán	2500
3.	Isfandak, Balúchistán	4000
4.	Dizak, Balúchistán	4000
5.	Near Bam, south-eastern Persia	4000
6–8.	Karmán, south-eastern Persia	5000
9.	Near Karmán	—
10.	Niríz, east of Shíráz	5000

The only constant difference that I can see between Persian specimens and the types described by Günther is that in the former there are always two temporals in contact with the postoculars. The nostril is always between three shields, one in front, the hinder edge of which forms a re-entering angle, in the point of which the nostril is situated, and two postnasals, the upper being narrow and elongate, extending for a varying distance above the loreal, and separating it from the præfrontal, the lower much higher, but shorter. In the type specimens of *P. Leithi*, the head is somewhat injured and the nasals not easily distinguished, but I think there are two shields behind the nostril. This does not, however, appear to have been the case in the specimens obtained by Stoliczka, and should Sind specimens prove always to have an undivided postnasal, the Persian form may be distinguished by this character, and by the constant presence of two temporals in contact with the postoculars.

The loreal is always very long, more than twice its height. The præocular is usually partially cleft in front, and in two specimens it is completely divided on one side of the head only, just below the superciliary ridge. It is always in contact with the vertical. Postoculars two always. Supralabials eight or nine, the latter number being the more common, and due to the third being divided, the fourth and fifth in one case, or the fifth and sixth in the other, entering the orbit, and the four posterior shields being larger than those in front.

The anterior frontals are comparatively small, being only about half the length of the postfrontals. The vertical is long, of moderate width in front, then it contracts suddenly, and is very narrow behind; it is nearly or quite as long as the occipitals. There is always a large temporal shield against the hinder part of each occipital.

The chin shields are very elongate, the hinder pair rather the longer of the two. The ventrals are not angulate, 180–188; subcaudals in three specimens selected for description 122–124 pairs.

The only young specimen I possess, about 20 in. long, has four broad longitudinal bands on the back, separated by narrow yellowish lines, but in no adult are these longitudinal stripes represented by anything more than lines of dark dots, and most of the specimens are uniform pale sandy brown or sandy grey above. There are sometimes one or two rows of small dots along each side of the ventrals. There is always a dark band along the loreal region continued behind the eye.

The first and second maxillary teeth are large, then there is a space followed by a still larger tooth, and after another shorter space six smaller teeth. At the back of the jaw are two large teeth, the anterior the larger. Altogether there are eleven teeth in each maxillary.

The largest specimen obtained measures 4 ft. In this the tail is slightly imperfect; when perfect it is about half the length of the head and body.

P. Leithi is common in Balúchistán and on the highlands of Southern Persia, inhabiting bushy plains and valleys. I have seen it, like *Passerita,* on bushes apparently hunting for prey. I did not observe it in Northern Persia.

79. **Taphrometopum lineolatum,** Brandt.—De F.

Coluber (Taphrometopon) lineolatus, Brandt, Bull. Ac. Sci. St. Pet. iii, p. 243, 1837.—Peters, P. Z. S. 1861, p. 47.

Psammophis Doriæ, Jan, De F. Viag. in Persia, p. 356.

Taphrometopon lineolatum, Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 185, Pl. IV.

1. Near Sáadatabád, 100 miles south-west of Karmán 7000

The only individual obtained agrees perfectly in external characters with specimens from Central Asia in the British Museum; the dentition appears to differ from Peters's description, but this may be due to some teeth being deficient; there appeared, when I examined the specimen just after capture, to be three small breaks in the series. The last tooth is longer than the others. I give a brief description, as that in the 'Proc. Zool. Soc.' scarcely mentions the characters of the head shields. The following account of the colouration and form was taken from the fresh specimen.

Body rather depressed; back flat. Head short, scarcely broader than the neck. Loreal region slightly concave. Pupil very small, slightly elliptical, being lengthened horizontally. Scales smooth, lanceolate, minutely punctated with brown, in seventeen rows. Ventrals 178; anal bifid; subcaudals in eighty-six pairs. Length 17.75 in., of which the tail from the anus measures 4.1.

Rostral rounded above, about as broad as high. Nostril between two shields; one large prænasal, with the hinder edge forming a re-entering angle to receive the point of the postnasal, the upper part of which is elongate horizontally, and runs back between the loreal and the frontals; on one side the postnasal is divided into a small lower shield and an elongate upper one. Præfrontals small, scarcely half the length of the postfrontals; they are convex in front and concave behind to receive the convex anterior margins of the postfrontals. The latter have very sinuate anterior and posterior margins, and are at least twice as long where they meet each other in the middle of the head as they are at the side, where their posterior margin is hollowed out to receive the præocular. Vertical elongately bell-shaped, square in front, rapidly decreasing in breadth just behind, and with its posterior portion long and narrow. Occipitals about the same length as the vertical, rather broad in front, their united posterior edge forming a re-entering angle, which receives a scale rather larger than those of the back. Loreal elongate, twice as long as high. Præocular single, large, in contact with the vertical. Postoculars two, equal. Temporals 2 + 2 + 3 on one side, 2 + 3 + 3 on the other, there being on each side a rather large shield against the occipital separated by two shields from the postoculars. Supralabials nine, the fourth, fifth, and sixth entering the orbit, the hinder four larger than those in front. Two pairs of chin shields, elongate, about equal to each other, each of the anterior in contact with five lower labials.

Colour:—Centre of the back light grey, bordered by a black band, the inner margin of which is broken, being formed of the black edges of whitish scales. Below the black stripe down each side is a whitish line of the same breadth, and then an olive-grey band which extends to the margins of the ventrals. These are white towards the side, with one dotted dark line down each side, cream-colour slightly mottled in the middle. Tail pale yellow below. The head has three longitudinal olive bands above, which coalesce on the frontals; the two outer run into the dark lines on the sides of the back. Another olive band runs along the side of the head through the eye and joins the dark stripes on the sides, and there are grey spots on the labials and chin shields.

I have compared my specimen of this snake with the type of *Psammophis Doriæ* in Turin, and they appear to correspond. As the postnasal in my specimen is divided on one side but not on the other, it is evident that this character, mentioned by Jan in his description of *P. Doriæ*, is of no importance. The type of *P. Doriæ* has three postoculars instead of two, but I doubt if this be a specific distinction.

80. * **Cœlopeltis lacertina** (Wagler).

Günther, Cat. Col. Sn. Brit. Mus. p. 138.—Eichwald, Fauna Casp.-Cauc. p. 122.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 179.
Coluber vermiculatus, Mén. Cat. Rais. p. 72.
Cœlopeltis vermiculata, Eichwald, Fauna Casp.-Cauc. p. 123, Pl. XXIX.
C. insignitus, Dum. et Bibr. Erp. Gén. vii, p. 1130.—Jan, Icon. Oph. livr. 34. Pl. I. fig. 2.

There are three specimens from Tehrán collected by the Marquis G. Doria in the collection at Genoa, but this snake has been omitted from De Filippi's list, and neither Major St. John nor I had the good fortune to meet with it. A Tehrán specimen has been figured by Jan (l. c.)

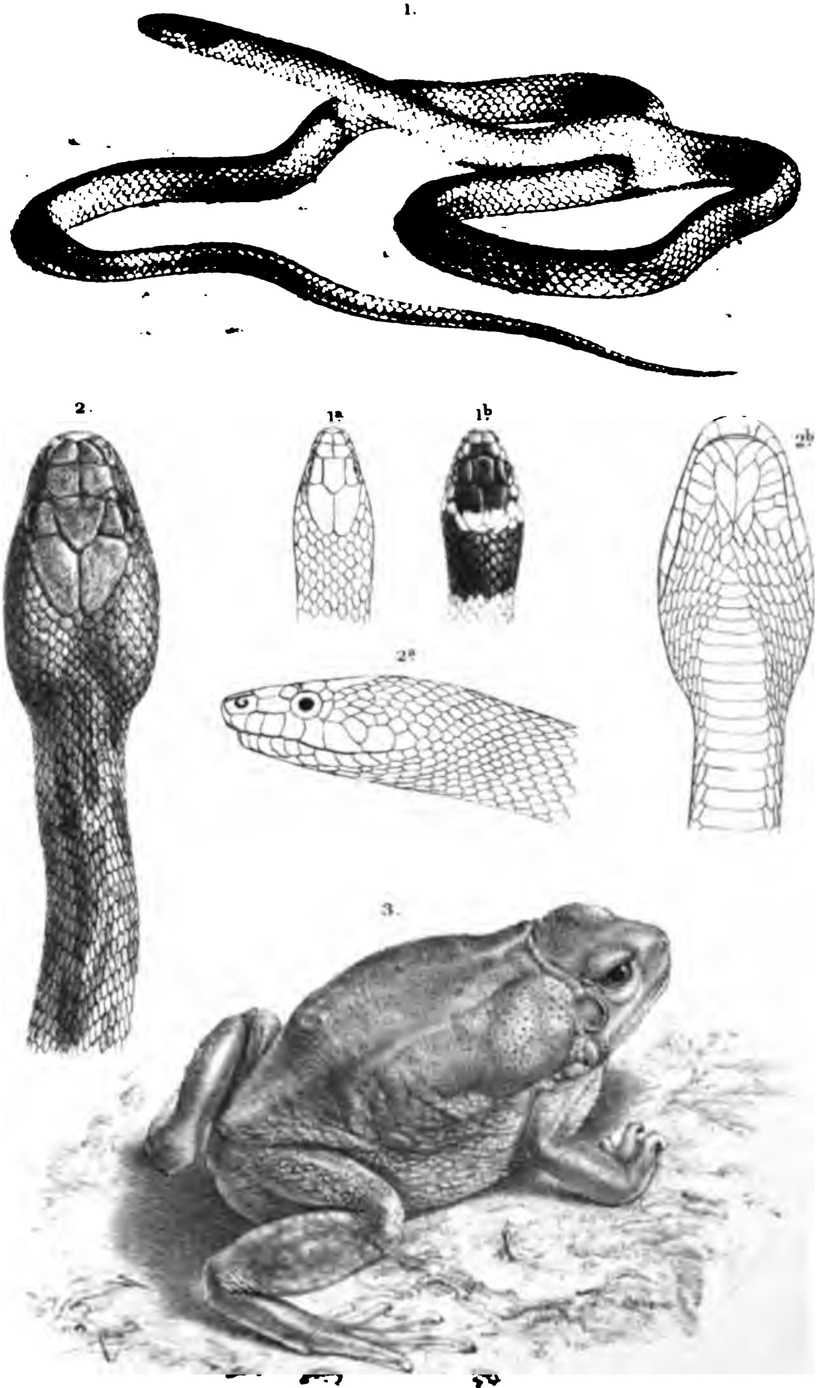
Family DIPSADIDÆ.

81. **Dipsas rhinopoma**, W. Blanf. Pl. XXVIII. figs. 2, 2 a, 2 b.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 34.
1, 2. Karmán 5000

D. *capite brevi, depresso; squamis corporis imbricatis in* 23 (24) *seriebus longitudinalibus, serie mediâ parum majore; naribus valvulis instructis; scutis supralabialibus* 8–10, *quarto quintoque oculum tangentibus, verticali brevi, vix longiore quam lato, subtriangulari; præocularibus duobus,* Pl. XXVIII.

Zoology of Persia



Ford

Mintern Bros imp.

1 CYCLOPHIS PERSICUS
2 DIPSAS RHINOPOMA.
3 BUFO OLIVACEUS

superiore ad verticale, inferiore ad nasale attingente, loreali distincto nullo; scutis ventralibus 268–274, *anali haud bifido, subcaudalibus* 76–77; *pallide griseo-fusca, transversim albido-fasciata, squamis nigro-puncticulatis.*

Hab. in Carmaniâ, Persiæ meridionalis.

Description :—Head of moderate length, broad and flat, considerably broader than the neck; body very slightly compressed; tail moderate, flat beneath. Scales of the body smooth, rhomboidal, imbricate, in twenty-three (occasionally twenty-four) rows, the dorsal row being a little larger than the others. Ventrals 268–274; anal undivided[1]; subcaudals in seventy-six or seventy-seven pairs. Teeth seven in each maxilla, four large ones in the front, then a space followed by two smaller teeth; the last is again large and grooved, and rather farther from the penultimate than that is from the next. Eye rather small, pupil vertical. Length of the largest specimen 47.5 in., of which the tail measures 6.75.

Head shields :—Rostral rather broader than high, just reaching the upper surface of the head. Præfrontals very narrow in front, rather shorter than the postfrontals and barely half as large. Postfrontals a little broader than long, slightly bent over on the side. Nostril large, in the centre of a nasal plate which is divided above the nostril, but below; nasal valvules distinct. The vertical is very short, and almost triangular, square in front, the lateral margins converging rapidly behind. Superciliaries rather short, much broader behind than in front. Occipitals rather short, about one-third longer than the vertical, in contact with the upper postocular only in front, much rounded behind. Two præoculars; the lower is united with the loreal, forming a shield about twice as long as high, and in contact with the second, third, and fourth supralabial: the upper præocular is in contact with the vertical. Postoculars two. Temporal shields not enlarged. Supralabials normally apparently eight, of which the fifth and sixth enter the orbit; but in one of the specimens there are nine on one side and ten on the other. Two pairs of elongate chin shields, the anterior much the larger.

Colour, when living, pale sandy brown, with numerous irregular pale waved transverse bands, much narrower than the intervening dark spaces, and more distinct near the head than farther back. All the scales are more or less minutely puncticulated with black. Ventral scales dusky, with sandy mottling. Head sandy above, with minute irregular black specks.

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[1] In one of the two specimens procured the anal shield is cleft, evidently by accident, the integument beneath being also divided.

The nearest ally of this species appears to be *Dipsas obtusa*, which, however, differs in having a separate loreal. The head shields bear a considerable resemblance to those of *Tachymenis vivax*, but the scales of the body are very different.

82. *Tachymenis vivax (Fitz.)—De F.

Günther, Cat. Col. Sn. Brit. Mus. p. 33.
Trigonophis iberus, Eichwald, Zool. Spec. iii, p. 175; Fauna Casp.-Cauc. p. 101, Pl. XVIII.—Mén. Cat. Rais. p. 66.
Tarbophis vivax, Dum. et Bibr. Erp. Gén. vii, p. 913.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 194.—Cope, Proc. Acad. Phil. xiv (1862), p. 338.
T. fallax, De F. Viag. in Persia, p. 355.

This snake is common in Transcaucasia and in many parts of Western Asia. The only known Persian locality is on the shores of Lake Urumiah, whence a specimen was procured by the Museum of Philadelphia.

FAMILY ELAPIDÆ.

83. Naja, sp.

Major St. John informs me that he once killed an unmistakable cobra in the plain of Bushire; he was riding, and his horse nearly trod on it, when it rose up and struck its head against the stirrup. It had an expanding hood, but so far as Major St. John can recollect, no spectacle mark. The belly was marked with orange or rose colour. No colouration of this kind is found, so far as I am aware, in either the Indian cobra *N. tripudians*, or in the African species *N. haje*, and it is possible that the snake seen by Major St. John may have been *Tomyris oxiana*, Eichwald, Faun. Casp.-Cauc. p. 104, Pl. XX, which is said by Strauch (Bull. Acad. St. Pet. xiii, p. 81) to be a *Naja*, and the throat of which is described as *flavo-rosea*. It inhabits the countries east of the Caspian, and may be found in Persia.

FAMILY HYDROPHIDÆ.

Sea snakes abound on the Balúchistán coast and in the Persian Gulf. Those enumerated below are doubtless but a very small portion of the species existing in those seas.

84. Hydrophis gracilis (Shaw).

1. Gwádar, Balúchistán coast.
2. Jashk, Persian coast, outside entrance to Persian Gulf.

Both specimens are very dark coloured, the head, anterior portion of the neck, and end of tail being dusky black throughout, whilst along the sides of the body are large white or yellow oval spots.

85. *H. viperinus (Schmidt).

Anderson has received this from Maskat, it must therefore be found on the Persian coast also.

Stoliczka obtained *H. curtus* (Shaw) and *H. Dayanus*, Stol., a new species allied to *H. Belcheri*, at Kárachí, and doubtless both may be found on the Balúchistán coast.

86. Enhydrina Valakadyen, Boie.

E. Bengalensis, Gray, Cat. Vip. Sn. Brit. Mus. p. 48.
1. Gwadár, Balúchistán coast.

87. Pelamis platurus (L.)

P. bicolor (Schneid.), auct.
1. Gwadár, Balúchistán coast.

The only specimen procured is greyish on the back, yellowish white below, the tail only marked with transverse blackish bands forming imperfect rings. There is one postocular only on one side, two on the other.

FAMILY VIPERIDÆ.

88. Vipera obtusa, Dwigubsky.—De F.

V. Euphratica, Martin, P. Z. S. 1838, p. 82. — Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 221, Pl. VI.

Echidna Mauritanica, Dum. et Bibr. Erp. Gén. vii, p. 1431.

Vipera Mauritanica, Strauch, Synopsis der Viperiden in Mem. Acad. Sci. St. Pet. xiv, No. 6, p. 79.

V. libethina, De F. Viag. in Persia, p. 357.

1. Niríz, east of Shiráz 6000

The *Vipera Euphratica* of Martin is so imperfectly described that only the preservation of the type in the British Museum could enable it to be recognised with certainty. The name of Dwigubsky has priority, and must therefore be retained, in the same manner as Hemprich and Ehrenberg's names for *Saxicolæ*, etc. are.

The following is a brief description of the specimen obtained. Head rather broad; snout broad, obtuse; *canthus rostralis* well marked; loreal region slightly concave; nostril below the canthus with a large plate in front of it, one of a row of somewhat enlarged plates which are in contact with the rostral. The latter is about as high as broad. A slightly enlarged plate above each nasal; eleven upper labials; one pair of chin shields.

Scales of the upper surface of the head, except on the end of the snout, and all the body scales rounded behind, imbricate, and with a filiform central keel; twenty-five longitudinal rows round the body. Ventrals 178; anal single; subcaudals in forty-six pairs.

Colour sandy grey, approaching cream colour, with ill-marked spots forming imperfect transverse bands towards the tail. The specimen obtained measures 32.5 in., of which the tail is 4.25.

I heard of a large viper in Balúchistán which may have been the same species. It does not appear to be common in Persia, but it is probably found here and there throughout the country. My specimen was from near Shiráz. Strauch states that it was found by Hohenacker in several parts of Transcaucasia, and the Marquis Doria obtained a specimen, now in Genoa, at Hamadán.

89. ***V. xanthina**, Gray.

Strauch, Syn. Vip. p. 73, Pl. I.
Daboia xanthina, Gray, Cat. Sn. p. 24.

A specimen is said by Strauch to have been obtained by Wagner in Adarbaiján, on the shores of Lake Urumiah.

Vipera berus and *V. ammodytes* are said by Strauch to be found in the Transcaucasian provinces of Russia, and may therefore very possibly occur in North-western Persia.

90. **Cerastes Persicus**, Dum. et Bibr.

Dum. et Bibr. Erp. Gén. vii, p. 1443.
Vipera Persica, Strauch, Syn. Vip. p. 103, Pl. II; Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 225.

1. Isfandak, Balúchistán 3500

In the only specimen obtained, a young individual measuring 13 in., the horn-shaped scale above the eye is about as long as the diameter of the eye. The nostrils are small, provided with distinct valvules, and situated between two shields, the lower of which is large and has a deep concave upper surface to receive the small upper nasal; there is an elongate shield above both. Pupil vertical. Two large chin shields, each in contact with four infralabials. The scales of the upper part of the head are distinctly imbricate, and all, except on the snout, keeled. Scales of the body finely keeled in twenty-five to twenty-seven longitudinal rows on the neck and twenty-four in the middle of the body. Ventrals 151; anal single; subcaudals in 43 pairs.

Colour, when fresh:—The head and back earthy grey, with a row of anvil-shaped or subtrapezoidal olive spots along each side, the outer edges of these spots elongate and very dark. Sides sandy with dusky spots, which are more numerous and closer together behind near the tail. A small spot on each side of the occipital region. A dark band, darkest on its upper margin, from the eye to behind the gape. Lower parts whitish.

This species was named by Duméril and Bibron from specimens collected by Aucher-Eloy. These were probably procured in Southern Persia, for Major St. John informs me that a horned viper, which is probably this species, abounds on the shores of the Persian Gulf, near Bushire. Strauch obtained this viper from Khorassán.

91. **Echis carinata** (Schneid.)—De F.

Dum. et Bibr. Erp. Gén. vii, p. 1448.—Günther, Rept. Brit. Ind. p. 397.—Strauch, Syn. Vip. p. 121.

E. arenicola, Boie, Isis, 1827, p. 558.—Strauch, Mem. Acad. Sci. St. Pet. xxi, No. 4, p. 228.

E. frænata, Dum. et Bibr. Erp. Gén. vii, p. 1449.

1, 2.	Samán, Dasht, Balúchistán	—
3, 4.	Kalagán, Balúchistán	3500
5.	West of Bampúr, Balúchistán	1800
6.	Near Karmán	—
7.	Between Karmán and Shiráz	—

This viper is common in Southern Persia and Balúchistán, but I did not meet with it north of Shiráz; it has, however, been found on the east coast of the Caspian. A specimen was brought from Sistán by Major Euan Smith. Some are much darker in colour than others, and whilst a few specimens have numerous black spots on the ventral scales, others have none.

The largest specimen I obtained measured 23 in. Its bite killed a small chicken in six minutes and a half.

FAMILY CROTALIDÆ.

92. **Halys Pallasii**, Günther.

Günther, Rept. Brit. Ind. p. 392.

Vipera halys, Pallas, Zoog. Ros. As. iii, p. 49.

Trigonocephalus halys (Pall.)—Mén. Cat. Rais. p. 73.—Eichwald, Fauna Casp.-Cauc. p. 102, Pl. XIX.—Dum. et Bibr. Erp. Gén. vii, p. 1495.—Strauch, Mem. Acad. St. Pet. xxi, No. 4, p. 231.

1–3.	Anán, Masendarán, Elburz mountains, north of Tehrán	6500

A specimen from Mangyschlak on the east coast of the Caspian, in the British Museum, precisely resembles those collected in the Elburz. I give a short description of the latter, as I can find no good one in any English work.

Description :—Head flat, moderately broad; snout rounded in front; pupil vertical. Scales of the body imbricate, in twenty-three longitudinal rows, all, except the two lowest rows on each side, with a sharp central keel. Ventrals 149–164; anal undivided; subcaudals in 36 to 44 pairs. The largest specimen obtained measures 22 in., of which the tail is 3. In a small specimen (probably a female), 10^{1} in. long, the tail measures less than an inch.

Head plates :—Rostral about as high as broad, only just reaching the top of the head. Anterior frontals small, triangular; posterior frontals rather rounded, about as broad as long, not bent over the side of the head. Vertical a little longer than broad; occipitals rather longer than the vertical, rounded behind. Nostrils between two shields; loreals and præoculars in two rows, the lower of which enclose the præocular pit. Two postoculars, the lower much the larger, extending under the eye. Upper labials usually seven (eight in one case), the third entering the orbit; the hinder labials are low, and above them is a row of large temporal scales. Lower labials about ten. A pair of large chin shields, each in contact with four lower labials.

Colour (noted when fresh) dusky olive brown, with numerous fainter rather narrow cross-bands; sides paler, with a row of diamond or arrow-head shaped spots along the edges of the ventrals. Head dusky above, a dark band surmounted by a pale superciliary streak along the side, broad on the temporals. Upper labials and chin whitish.

This species appears to be common in the Elburz mountains, but it is unknown in other parts of Persia. It does not appear to have been found in the Caucasus, its western range, so far as is known, terminating in the mountains of Tálish[1]. In the countries south of the Caspian it inhabits forests. It has the farthest western range in the old world of any crotaline snake.

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[1] As Ménétries's statement of the occurrence of this snake in the Tálish mountains had not been confirmed by later collectors, and as the original specimen could not be found, Strauch was rather inclined to suspect an error in the locality. The rediscovery of the species in the Elburz shows that Ménétries was in all probability right.

AMPHIBIA.

THE *amphibia* are very poorly represented in Persia. But two species of *Batrachia* are known to be generally distributed throughout the highlands, a few others being met with either in the Caspian provinces or in Balúchistán. Of the *Urodela* two species of newts have been described by Strauch from Northern Persia.

BATRACHIA.

FAMILY RANIDÆ.

1. * **Rana temporaria**, L.—De F.

R. oxyrhina, Steenstr., De F. Viag. in Persia, p. 357.

Eichwald mentions (Fauna Cauc.-Casp. p. 125) the occurrence of the common frog of Europe in the parts of Persia near the Caspian Sea. De Filippi met with the variety distinguished as *oxyrhina* by some naturalists at Sultániah, between Tabriz and Kazvín, and suggests that this form replaces the typical *R. temporaria* in Western Persia.

2. **R. esculenta**, L.—De F.

Günther, Cat. Bat. Sal. Brit. Mus. p. 12.
R. Tigrina, Eichwald, Fauna Casp.-Cauc. p. 125.
R. cacchinans (Pall.), Ib. p. 126, Pl. XXX.

1, 2. Basráh, on the Shat-el-Arab (the Tigris and Euphrates united).
3, 4. Near Shiráz.
5. Near Resht.

This is the common frog of the Persian highlands. I did not, however, meet with it far east of Shiráz. There are specimens in the British Museum brought from the Euphrates.

Eichwald's figure represents the common colouration of Persian specimens, olive above, with large black spots and a pale dorsal stripe.

In some the stripe is wanting, and the ground colour is sometimes bright green, with or without spots.

The specimens from the Euphrates valley have decidedly longer webs to the hind feet than those from the Persian highlands, and there is no trace of emargination in the former, but similar differences are to be found amongst European specimens.

3. **R. cyanophlyctis**, Schneid.

Günther, Rept. Brit. Ind. p. 406.

1–20.	Píshín, Balúchistán	700
21.	Húng, Balúchistán	2500
22.	Ghistigán, Bampúsht, Balúchistán	3000
23, 24.	Dizak	4000

I can see no difference between Balúchistán and Indian specimens. Stoliczka has already (Proc. As. Soc. Beng. 1872, pp. 85, 102, 130) noticed the occurrence of this species in Sind, the Panjáb, and Kachh, so that its extension into Balúchistán is not surprising.

I found *R. cyanophlyctis* common in Balúchistán up to an elevation of 4000 feet wherever there was water. I did not notice it in Persia proper.

FAMILY HYLIDÆ.

4. **Hyla arborea** (L.).

Günther, Cat. Bat. Sal. Brit. Mus. p. 107.—Anderson, P. Z. S. 1872, p. 403.
Hyla viridis, Laur.—Eichwald, Fauna Casp.-Cauc. p. 124.

1. Basráh, on the Shat-el-Arab (Tigris and Euphrates joined).
2–7. Párchapá, south of Resht, Ghilán, Northern Persia.

This species has not been found in Persia proper. Its occurrence in the Caspian provinces and in Mesopotamia was known before. I found it abundant amongst grass and bushes on the banks of a stream close to a caravanserai called Párchapá, on the road from Kazvín to Resht. All the specimens seen were small, about an inch in length.

FAMILY BUFONIDÆ.

5. Bufo viridis, Laur.—De F.

Günther, Cat. Bat. Sal. Brit. Mus. p. 58.—Anderson, P. Z. S. 1872, p. 402. *B. variabilis*, Pall. — Eichwald, Fauna Casp.-Cauc. p. 126. — De F. Viag. in Persia, p. 357.

1.	Dizak, Balúchistán	4000
2–4.	Near Bam, South-eastern Persia	4000
5, 6.	West of Bam	5500
7, 8.	Near Resht, Ghilán, Northern Persia	—

Some specimens are marked with large spots above, others are unspotted. This toad is found throughout Persia, and extends into the Himalayas. I have even obtained specimens as far east as Sikkim. In Balúchistán it appears to be replaced by the next species.

6. B. olivaceus, W. Blanf. Pl. XXVIII, fig. 3.

Ann. and Mag. Nat. Hist. July 1874, xiv, p. 35.

1, 2.	Dasht river, Balúchistán	—
3.	Báhú Kalát, Balúchistán	—
4.	Ghistigán, Bampúsht, Balúchistán	3000

B. *affinis* B. viridi B. vulgarique, *ab ambobus differt glandulis parotoideis majoribus valde latioribus, ovalibus, dorso subglabro; supra pallide olivaceus, subtus albescens.*

Hab. in Gedrosiâ (*Balúchistán*).

Description :—Tympanum distinct, about half the size of the eye; head short, muzzle rather pointed; crown of the head slightly concave, quite smooth, without any trace of bony ridges; *canthus rostralis* rounded. Parotoids very large, but not much raised; they are oval in form, the posterior portion being slightly produced; they extend from a third to nearly one-half the length of the body behind the head, and their breadth equals or exceeds half their length; they are nearly flat, being slightly concave in front and convex behind. Upper parts nearly smooth; lower abdomen finely tuberculate. Limbs moderate; the hind-limb exceeds the body by about the length of the foot. Soles of feet and under surface of tarsus covered with small tubercles; two small subequal prominences on the metatarsus; toes half webbed; the first finger longer than the second.

Colour pale olive above, whitish below. In adults the tips of the fingers and toes are dark coloured, and in two specimens the first and second fingers are blackish above.

This toad is near *B. viridis* and *B. vulgaris*, but distinguished from both by its very large broad flat parotoids, and to judge by the specimens collected, by its much smoother back.

I found a few specimens in Balúchistán, none of them at elevations exceeding 3000 feet above the sea. Above that height this species was replaced by *B. viridis*.

7. *? **Bufo vulgaris**, Laur.

Rana Bufo, L., Pall. Zoog. Ros. As. iii, p. 14.

I insert the common toad on Pallas's authority. It does not appear to have been noticed in Persia by later travellers, though it probably exists in the Caspian provinces.

URODELA.

Family SALAMANDRIDÆ.

8. * **Triton Karelini**, Strauch.

Strauch, Mem. Acad. Sci. St. Pet. xvi, No. 4, p. 42, Pl. I, fig. 1 (1870).

Of this species and of that next mentioned I know nothing beyond the description which is given in Strauch's 'Revision der Salamandriden-Gattungen,' l. c. The specimens described as *Triton Karelini* were collected by Karelin in North-eastern Persia, but no exact locality was recorded.

9. * **T. longipes**, Strauch.

Strauch, Mem. Acad. Sci. St. Pet. xvi, No. 4, p. 44, Pl. I, fig. 2 (1870).

This species is from Mazandarán, near Astrabád.

Triton cristatus, Laur., and *T. ophryticus*, Berthold, are found in Transcaucasia, and *T. tæniatus* (Sehn.) in Armenia.

I did not see any newts in Persia, and Major St. John tells me that during a residence of several years he never met with one. I think it probable that there are none except in the northern parts of the country.

ERRATA.

The number of species of birds, as stated at p. 7, known to inhabit Persia should be 384 instead of 383. The *Grallæ* are 54 in number instead of 53, the *Gaviæ* 21 instead of 22, and the *Steganopodes* 7 instead of 6.

At page 20, for '**Vespertilio desertorum**,' substitute:—

Vespertilio emarginatus.

Vespertilio emarginatus, Geoffroy, Ann. du Muséum, vol. viii, p. 198 (1806).

Sub-species a, **V. desertorum**, Dobson, n. subsp.

At page 23, for '**Vesperugo leucotis**, Dobson,' substitute:—

Vesperugo Kuhlii.

Vesperugo Kuhlii, Natterer: in Kuhl, Deutsch. Flederm.—Wetterau, Ann. iv, p. 58.

Var. **V. leucotis.**

Vesperugo (*Pipistrellus*) *leucotis*, Dobson, J. A. S. B. (1872), pt. ii, p. 222.

At p. 51, FAMILY MYOXIDÆ has been omitted before *Myoxus pictus*, which is thus represented as if belonging to the *Castoridæ*.

In the measurements of rodent skulls, pp. 55, 57, 67, 69, 71, for 'breadth of frontal bones behind postorbital processes,' read 'breadth between orbits.'

On Pl. XV, for SITLA read SITTA.

On Pl. XXVII, for ABLEPHARUS PUSILLUS read ABLEPHARUS BRANDTI.

GEOLOGY OF PERSIA.

GEOLOGY.

PART I.

GENERAL SKETCH.

1. Introduction.—Previous Observers.

The following pages contain no complete account of the geology of Persia: our knowledge of this extensive country is as yet far too imperfect for any general description of its geological formations to be attempted. My own observations were of course restricted to the route I followed from the Indian Ocean at Gwádar to the Caspian at Enzeli, and most of the other travellers who have left any record of the geology, have, in the same manner, merely traversed particular roads. Some of them, however, remained much longer in Persia than I did, and consequently had the opportunity of examining larger areas. My own journey in Persia lasted rather more than seven months, in addition to which two months were spent on the Makrán coast and in the Persian Gulf, but even of this time much was lost from the frequent necessity of halting in cities away from any interesting geological sections, and of hurrying past those places where delay would have been profitable.

In order moreover to attempt to correlate with any hope of success the various descriptions given by other travellers, it would be necessary to possess from personal examination a sufficiently extensive knowledge of the geological formations of Persia to justify my criticising the observations and conclusions of my predecessors. This extensive knowledge I had not the means of acquiring. All therefore that I shall attempt in the present sketch will be to give a very brief summary of the principal geological features of the country, so far as they have hitherto been ascertained by other travellers and by myself, and to add a somewhat more detailed account of my own observations on the line of route which I followed.

There are many geological observations to be found in the various works published on Persia, their value varying with the geological knowledge of the writers. To call attention to all would be profitless, and the following list only includes the more important notices, or those which apply solely to the geology of the country.

By far the greater number of travellers who have given an account of the geology of parts of Persia have been restricted to the north-western provinces. Only a few have penetrated east of Damávand or south of Tehrán. Thanks to Mr. Loftus we have a very fair knowledge of Western Persia, and various Russian and German explorers have made us tolerably acquainted with Adarbaiján, Ghilán, and Mazandarán. Khorassán, and indeed Eastern Persia generally, is quite unknown geologically, whilst the south is almost equally a *terra incognita*, as a few observations on the shores of the Persian Gulf are all that have hitherto been recorded.

The earliest contribution to Persian geology with which I am acquainted is in the form of anonymous 'Notes made in the course of a voyage from Bombay to Bushire in the Persian Gulf,' published about 1822, in the 'Geological Transactions,' Ser. 2, vol. i, p. 409. Brief descriptions are given of the rocks at Maskat, and on Kishm, Hormúz, and other Gulf islands. The accounts are somewhat scanty and not always accurate, as, for instance, when the author states at Hormúz that 'no rock of salt has been discovered,' which shows that very little attention was paid to the island, for rock-salt exists in enormous quantities. On the other hand the description of the rocks near Maskat appears to be good and accurate.

In the same work, Ser. 2, vol. v, p. 577, Dr. C. M. Bell published some 'Geological Notes on part of Mazandarán.' He described the rocks observed on a journey from Tehrán *viá* Damávand village, Aminabád, Firúzkúh, and the valley of the Talár to the Caspian, returning by Amol and Ask. He noticed the occurrence of various volcanic rocks, limestones of different kinds, sandstone, shale, coal, &c., but he affords very little aid towards making out the relations of the various formations.

F. A. Bühse, a botanist, travelled in 1847–48–49 in several parts of Northern Persia, his only journeys off the beaten track being from Resht *viá* Damávand to Astrabád, and from Astrabád *viá* Sháhrúd to Yezd, across the salt desert. His notes, published in the Bulletin de la Société Imperiale des Naturalistes de Moscou, vols. xxiii, xxviii, and xxxiv, contain a few geological observations, the most important of which is his description of the salt desert; op. cit. xxiii, p. 557, and xxviii, pp. 293–306. By his account the salt portion of the desert is only a few miles across, and much resembles the salt marsh crossed by Major St. John and myself in Sarján, between Karmán and Shiráz. In the Bulletin de la Société Géologique de France for 1850, Ser. 2, vol. vii, p. 491, is a short account by M. A. Visquenel of the journeys and collections made in Persia by Mons. Hommaire de Hell, who died at Isfahán in 1848. He had travelled from Trebizond on the Black Sea *viâ* Diarbekir, Van, and Tabriz to Tehrán, visited several parts of Eastern Mazandarán and the Elburz mountains, his journeys extending as far as Astrabád, and finally he went to Isfahán, where he died a few days after his arrival. His collections of fossils were examined by M. de Verneuil, and comprised Devonian species collected on the southern slopes of the mountain of 'Schebennemé[1]' and of the central axis of the Elburz chain between the valley of the Nebha and that of the Suiva[2]; cretaceous fossils from Yeni-Hissár near Rádkán, and nummulitic from the same neighbourhood and also from a mountain called Khealanek, north-west of Tehrán.

Dr. C. Grewingk's 'Die geognostischen und orographischen Verhältnisse des Nördlichen Persiæus' (the geological and orographical relations of Northern Persia), published in 1853, is a digest of the notes and collections obtained by Dr. F. Bühse and Lieut.-Col. Woskoiboinikow[3] during their journeys in Northern Persia, combined with such information as had been obtained by previous travellers. It suffers apparently from the disadvantage that the author had no personal acquaintance with Persia, but it nevertheless contains much information, and is accompanied by a geological map. The region described comprises Adarbaiján, Ghilán, and Mazandarán, with a small tract south of the Elburz.

It is difficult without entering into great detail to give an adequate idea of this singular and interesting paper. It commences with an 'orographical sketch,' giving a general account of the physical geography of Adarbaiján and the Caspian provinces. Then follows a geological description in detail of various tracts and routes, beginning with the valley of the Araxes, and ending with the route from Sháhrúd to Astrabád. The third part of the paper consists of a geological summary (Geognostische Uebersicht), showing the distribution of various formations throughout the country. Some of the classification does not appear quite correct, for instance, Hippuritic limestone is mentioned under the head of Jurassic formations, and beds containing *Odontopteris Lamia* (*Palæozamia*) and *Pterophyllum* are included in the carboniferous series; but these are trifling drawbacks.

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[1] I do not know what mountain is meant, and therefore preserve the original orthography.

[2] This locality is close to Rádkán, S.W. of Astrabád.

[3] Of the travels of this officer some notes are published in the 'Journal des mines de St. Petersbourg,' 1846, tome ii, p. 171; and in Erman's Archiv für Russland, v, p. 674, but everything of importance is, I believe, repeated in Grewingk's paper.

Briefly it may be stated that Dr. Grewingk records the existence of silurian rocks (including perhaps Devonian) in three places; one, Gir, lying some miles north of Kazvín, the other two being at Chalikhán, west of Sháhrúd, and at the foot of the hills south of the latter place. Carboniferous rocks (including, besides mountain limestone, Liassic coal measures with Cycads) have a wide extent, being traced almost from end to end of the Elburz; they reappear in the Araxes valley where the carboniferous limestone rests on Devonian rocks. Jurassic beds are said to occur near Argán and Massula, north-west and west of Resht, and again near Surt, fifty miles west of Sháhrúd. Some localities are also mentioned on the Araxes, near Ordubád, nearly due north of Tabriz, but the fossils enumerated as occurring appear to be cretaceous. Cretaceous rocks are shown on the map, and described in the text as occurring here and there throughout the Elburz, and also as covering a considerable area in Adarbaiján, north of Tabriz, and on the flanks of the Sahend mountains, east of Lake Urumiah. Grewingk, however, points out that in several of the localities indicated, and especially in the last, the age of the rocks is not clearly determined. So far as my own observations are concerned, I greatly doubt the existence of cretaceous rocks along the southern base of the Elburz from Tehrán to Kazvín, as shown on Grewingk's map. Nummulitic limestone is said to be found usually in Northern Persia, associated with upper cretaceous beds. It is described as occurring in the Araxes valley near Nakhicheván, Julfa, etc., in the hills east of Rúdbár, between Kazvín and Resht, and again west of Sháhrúd[1]. On the map all tertiary and post-tertiary deposits, including the alluvial desert plains, are represented of one colour. Volcanic rocks of various kinds form the Sahend mountains south of Tabriz, the Savalán near Ardabil, some of the ranges north and north-east of Kazvín and Damávand, besides minor outbursts. Metamorphic and granitic rocks are said to be found north and west of the Lake of the Urumiah, in the 'Schaverdih' (Shecvek?) mountains in Karadágh, and along the lower ranges of the Elburz, facing the Caspian, from Massula west of Resht to a spot a little west of north from Tehrán.

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[1] Dr. Grewingk also states that Nummulitic limestone is found at Schirkúh (? Síyah Kúh) near Yezd and at 'Cohurt' between Isfahán and Káshán. The latter place may be identical with Kohrúd as appears probable from the context, but I did not observe any limestone of Nummulitic character. Dr. Grewingk's orthography of proper names in ultra-Teutonic is not always correct. [For Shír-kúh, near Yazd, see p. 172, vol. i.—*F.J.G.*]

The want of personal knowledge of the region of course detracts greatly from the value of this paper, and especially of the map, but considering the difficulties under which it was written it is a very valuable contribution to our knowledge of the country.

By far the best and most complete geological account which we possess of any part of Persia is W. K. Loftus's paper 'On the Geology of portions of the Turko-Persian Frontier, and of the Districts adjoining,' published in the Quarterly Journal of the Geological Society for 1855, vol. xi, p. 247[1]. Mr. Loftus was attached as geologist to the English Commission under Lieut.-Col. Williams (subsequently Sir W. F. Williams of Kars), appointed to assist in determining the frontier between Turkey and Persia in the years 1849–52. The paper is accompanied by a map on which, without any attempt at detail, the broad geological features of the great range of hilly country intervening between the Tigris and Euphrates plains and the Persian plateau are laid down. This map extends along the whole Turko-Persian frontier from Mount Ararat to the Persian Gulf. Numerous detailed sections of the Zágros, Kúrdistán, and other ranges are described and figured, but the memoir, owing to the author's departure from England, was left unfinished.

Mr. Loftus shows that the ranges forming the western flank of the Persian plateau consist mainly of granite and metamorphic rocks, altered limestones and slates, some of which are probably of mesozoic age, cretaceous, nummulitic, and post-nummulitic deposits. These formations as a rule succeed each other in ascending order from east to west, the oldest rocks being close to the Persian plateau, whilst the plains of Mesopotamia are bordered by a broad unbroken bed of the post-nummulitic rocks, classified by Loftus as the Gypsiferous series.

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[1] An abstract of this paper appeared in vol. x, p. 454.

The age of this series is not exactly determined, very few fossils being found in it, but it has been shown to have an extensive range throughout Western Asia, and it is perhaps represented in Sind and the Panjáb. Locally some other formations were observed, some lower secondary limestones occurring between Básht and Faliyán, north-west of Shiráz, and palæozoic beds being noticed at one spot, south-west of Isfahán. Volcanic rocks are of unimportant extent in the southern portion of the area described, but occupy a considerable tract near the lakes of Ván and Urumiah, and culminate in Mount Ararat.

Some notes by M. N. de Khanikoff, communicated by Professor Abich to the Imperial Academy of Sciences, St. Petersburg, Bull. Ac. Sci. xvi, p. 348, contain a few geological observations made in Adarbaiján. They add little, if anything, to what was known before, except that a collection of fossils from the limestone forming the islands of Lake Urumiah proved, according to Professor Abich, who gives a list of them, of miocene age.

Professor H. Abich's 'Vergleichende Geognostische Grundzüge der Caucasischen, Armenischen, and Nordpersischen Gebirge' (Comparative Geological Grundzüge laws of the Caucasian, Armenian, and North Persian Mountains), was also published in 1858 (Mem. Acad. Sci. St. Pet. vol. vii). It refers principally to the Caucasus and the Transcaucasian provinces of Russia, which have been very carefully examined by the author, a distinguished geologist in the service of the Russian government; but there are several interesting notes on localities in Persia, principally in the province of Adarbaiján.

The first portion of the paper (pp. 1–45) is occupied with a discussion of the direction of lines of elevation (Erhebungsrichtungen). These in North Persia are all reduced to three principal systems running approximately north-west to south-east, and north-east to south-west, or rather east-north-east to west-south-west. A doubt may be expressed whether the data given justify the conclusions; e.g. the direction of the Elburz range north of Tehrán is said to be east and west, and it is determined by the relative position of Damávand and of two other peaks, one lying east of it, the other west. Why these mountains are chosen, and what may be their geological composition and their relations to Damávand, is not stated. Damávand itself is a subrecent volcanic rock, of far later date than the other rocks of the range, and lying considerably north of the watershed.

The second part of Professor Abich's memoir (pp. 45–75) relates to the distribution of hot and mineral springs, outbursts of inflammable gases, naphtha localities, lines of extinct volcanoes, dykes, and mineral veins, all chiefly considered in connexion with the theories of Elie de Beaumont and others on mountain elevation, in which theories Professor Abich is a firm believer. This part relates solely to the Caucasus, Georgia, and Armenia; the volcanic formations of the Elburz, Savalán, the neighbourhood of Tabriz, Lake Ván, etc., not being mentioned.

The third portion (pp. 75–163) is devoted to the sedimentary rocks. The greater part of this also refers to countries beyond the Persian border, but occasional descriptions are given of parts of Persia. Thus at p. 76, in treating of the Palæozoic rocks, a section is described through the Meror Dágh range, near Sofian, north of Tabriz, exhibiting besides metamorphic and volcanic rocks, palæozoic limestones (probably Devonian), gault (?) and Lunulite limestone. The extensive spread of Devonian and Carboniferous limestone in Adarbaiján and the Elburz is mentioned; they are said to closely resemble each other, and to be distinguished with difficulty, except by their fossils.

The existence of Jurassic rocks south of the village of Gerger, near the right (south) bank of the Araxes, is mentioned (pp. 91–92), and it is suggested that rocks of similar age have a wide extension in Northern Russia.

In his description of the cretaceous rocks, Abich especially points out (pp. 120–121) the remarkable extent to which deposits of this age in the mountains of Georgia and Armenia have been affected by volcanic outbursts of the cretaceous and early tertiary epochs. No such evidence of igneous action was remarked in rocks of the same period north of the Caucasus. This is extremely interesting, because there appears much reason for believing that many of the volcanic outbursts of Southern Persia also are of cretaceous age.

No special description is given of cretaceous formations within the boundaries of Persia, and the same remark applies to Abich's account of the tertiary and quaternary periods. It is shown that the great gravel and conglomerate deposits of the Armenian plateau, Georgia, and the Caucasus are older than the last great volcanic outbursts of those regions, but at the same time local gravels, etc. exist contemporaneous with the lava-flows. Finally, the absence in the region of the Caucasus of any extensive accumulation of erratic blocks, and consequently of any evidence of a great former extension of the glaciers, is insisted upon. There is also a want of the polished and scored rock surfaces, which, in the mountains of Europe, extend so far below the level of existing glaciers.

In the Journal of the Asiatic Society of Bengal for 1859, vol. xxviii, p. 41, and in that for 1860, vol. xxix, p. 359, is a 'Report on Geological Specimens[1] from the Persian Gulf, etc., collected by Captain C. G. Constable, I. N.' This account is by Dr. Carter of Bombay. The specimens procured appear to have afforded a very fair means of ascertaining the nature of the rocks occurring in the various islands of the Gulf, which are correctly stated by Dr. Carter to consist of a sedimentary formation, resting upon volcanic rocks associated with beds of rock-salt, gypsum, sulphur, pyrites, specular iron ore, etc. In some islands the volcanic and saliferous series is absent. The sedimentary formations are (also quite correctly) said to include thick calcareous clays capped by a calcareous shelly grit, resembling the formation called milliolite by Dr. Carter, which occurs in Kathiawár in North-western India, and on the south-east coast of Arabia. These beds are considered to be miocene. In the first part of the paper the islands along the Persian coast are described, in the second part those on the Arabian coast, the same formations being found in both. The data given are to a large extent derived from notes and sketches by Captain Constable and Lieutenant Stiffe, who collected the specimens.

Dr. Theodor Kotschy gave in Petermann's Mittheilungen for 1859, p. 49, an account of an ascent of Damávand, with (p. 67) a few petrological notes.

Notes by the Hon. C. A. Murray on some mineral springs near Damávand, and on some copper ore and other minerals from near Tabriz, were published in the Quarterly Journal of the Geological Society for 1859, vol. xv, pp. 198 and 605. Professor W. W. Smyth examined the minerals and gave a brief description of them (p. 606). The copper ores probably indicate the existence of valuable deposits.

In the Bulletin Acad. Imp. Sci. St. Petersburg for 1861, vol. iii, pp. 292–299, Professor H. R. Göppert published a paper, which was translated in the Quarterly Journal of the Geological Society for 1862, vol. xviii, pt. 2, p. 17, 'On the Occurrence of Liassic Plants in the Alborus (Elbrus) range, Persia,' etc. In this a brief description is given of a small collection of fossil plants found by Dr. Göbel, who accompanied M. de Khanikoff's mission as geologist, in the Eastern Elburz, east of the village of Tásh, in the province of Astrabád. The plants included a species of *Pterophyllum* (either *Pt. Abichianum* or an allied form), *Zamites distans*, *Nilsonia Sternbergii*, *Alethopteris Whitbiensis*, *Tæniopteris vittata* and *Comptopteris Nilsonii*, all liassic or volitic species.

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[1] For shorter notices and descriptions of rock specimens from the Persian Gulf, see Brust, Jour. Bombay Br. Roy. As. Soc., i, p. 345, and Newbold, op. cit., vol. iii, pt. 2, p. 26.

De Filippi's 'Note di un Viaggio in Persia,' published in 1865, contains numerous geological observations made on his journey. He went from the Black Sea *viâ* Tiflis, Julfa, Tabriz, and Kazvín to Tehrán, made a visit from the capital to Damávand, and returned by Kazvín and Resht. Amongst the most important facts mentioned is (pp. 199–208) the occurrence of remains of pottery in beds considerably below the level of the plain near Sainkála, north-west of Kazvín, where the alluvial deposits are cut through by a stream called the Abhar. Hence De Filippi concludes that the present surface of the plain near Sainkála, and probably of the other plains of the Persian plateau, is of later date than human occupation. The absence of any evidence of ancient glacial action in the Elburz is noticed (p. 254), and a very good description given of Damávand, which was ascended by several members of the Embassy (pp. 257–279). There is further in the 18th chapter of the work, pp. 303–325, an excellent discussion of the question as to the former extension of the Caspian. De Filippi treats this subject in a masterly manner, he points out that the Caspian fauna is essentially lacustrine, and concludes on zoological grounds that the Caspian has never been in direct communication either with the Black Sea or the Arctic Ocean. This subject, although appertaining rather to physical geography than to geology, is of too much interest to remain unnoticed.

A brief note on the geology of the country between Bushire and Shiráz, by W. H. Colvill, is printed in the Transactions of the Bombay Geographical Society, xvii, p. 167, in connexion with a paper by Colonel Lewis Pelly.

In a 'Note on the Geological Formations seen along the Balúchistán Coast from Karáchí to the head of the Persian Gulf, and on some of the Gulf Islands[1],' published in the 'Records of the Geological Survey of India' for 1872, pp. 41–45, I briefly described the occurrence of a great group of rocks of later tertiary age extending along the coasts in question, which I called the Makrán group, and I also noticed the salt-formation of Hormúz and the neighbouring islands. In another 'Note on Maskat and Masandam on the East Coast of Arabia' (Records Geol. Survey, 1872, p. 75), I pointed out that there is reason to believe that movement in different directions has taken place on the two coasts of the Straits of Hormúz, the Persian shore showing evidence of elevation, whilst the Arabian coast has apparently sunk in recent geological times[1].

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[1] I should state that this note was written at Gwádar, and that I had no works to refer to, or I should have noticed Dr. Carter's paper describing Captain Constable's specimens from the islands of the Persian Gulf.

Lastly, in the 'Quarterly Journal of the Geological Society' for 1873, vol. xxix, p. 493, I gave a short account of the 'Nature and Probable Origin of the Superficial Deposits in the Valleys and Deserts of Central Persia,' with a brief description of the sands, clays, and gravels which cover so large a part of the country, and their probable connexion with a greater rainfall in former times, and a gradual decrease at the present epoch.

Mr. A. H. Schindler furnished some 'Notes on the Geology of Kázrún' to the Quarterly Journal, Geol. Soc. 1873, xxix, p. 381, from which it appears probable that beds of later tertiary age, belonging perhaps to the Gypseous series of Loftus, exist near the locality named, which is about 60 miles west of Shiráz. In the same Journal for 1874, xxx, p. 50, Lieut. A. W. Stiffe gave a very interesting short paper, 'On the Mud Craters and Geological Structure of the Makrán Coast,' in which, in ignorance of my note on the same tract, published the previous year, he entirely confirmed my view that one great newer tertiary group of clays, sandstones, &c. prevails along the whole coast, whilst the cursory examination of some of the fossils by Mr. Etheridge resulted in their being attributed to the miocene age. Lieut. Stiffe also called attention to the great submarine cliff extending along the Makrán coast, at a distance of from 10 to 20 miles from the present shore.

2. GENERAL GEOLOGICAL FEATURES AND THEIR RELATIONS TO THE PHYSICAL GEOGRAPHY OF PERSIA.

It is well known that Persia consists principally of a table-land, and that a great part of its surface is composed of desert plains at an average elevation of between 3000 and 4000 feet above the sea. Less attention has however been paid to the very curious fact that the edges of this table-land are everywhere higher than the interior, and that from the whole surface of Persia, with the exception of a narrow belt of land along the coast of the Arabian Sea and Persian Gulf, and of the western watershed of the Zágros and Kúrdistán mountains, not a river finds its way to the ocean, or to any sea in communication with oceanic waters[1]. Not only is there no constant stream flowing from the interior of Persia, but no watercourse communicates with the sea from the interior of the country, and every drop of rain which falls on the Persian plateau is evaporated within its limits.

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[1] There is, however, a submarine cliff off the Makrán coast, which is, perhaps, due to depression previous to the last elevatory movement.

The whole of Persia may be divided into three hydrographical areas; (1) the country watered by streams flowing into the Caspian; (2) the southern and south-western region draining into the Tigris, the Persian Gulf, and the Arabian Sea; and (3) the plateau. The first comprises the northern part of the province of Adarbaiján, which is drained by the Araxes, the southern portion drained by the Kizil-Uzun, and the Caspian provinces of Ghilán and Mazandarán. The second tract, as already pointed out, consists of the western slope of the great ranges of mountains extending from Ararat to the neighbourhood of Shiráz, the southern portions of which were known to the Greeks as the Zágros, together with the small portion of the Tigris plain belonging to Persia, and the country along the coasts of the Persian Gulf and the Arabian Sea for a varying distance inland. The remainder of Persia constitutes the plateau, and includes geographically Afghánistán and the northern portion of Kalát. The boundaries of this region are,—to the north, the Elburz and the ranges joining it to the Parapamisus; to the west, the mountains of Kúrdistán and the Zagros; to the east, the Suleimán and other ranges on the borders of India, and to the south, the chains of southern Karmán and Balúchistán. The valley plains of Herát and Mash-had should be excluded, because the streams watering them run out into the great Aralo-Caspian plain to the north.

So far as the surface of the Persian plateau has been surveyed it consists of a number of isolated plains of varying extent and elevation above the sea, all without any outlet, and separated from each other by ranges of hills, frequently of considerable height. The lowest portion of each of these plains is generally a salt lake or marsh[1]. If there be a lake, its level often fluctuates, and one or two seasons of deficient rainfall suffice to lay bare the greater portion of its beds, or to convert it into a marsh.

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[1] On all maps hitherto existing, a stream is shown running south-west from Sarawán in Northern Kalát, across the southern part of the desert north of Balúchistán, and joining the Dasht river which passes by Kej and enters the Arabian Sea west of Gwádar. The surveys of Majors St. John and Lovett have shown that this is an error.

Rivers are few in number, and singularly small in volume; in fact, not the least striking physical feature of the country consists in their paucity or absence. The whole of Persia, except near the shores of the Caspian and on the western slopes of the Zágros, is, in fact, a desert, and all cultivated oases owe their fertility to irrigation from springs, or from the small streams fed by the rain and snow of winter.

Such being the general character of the region, barren isolated plains, separated from each other by equally barren hills, it remains to point out briefly the geological features presented, features closely in connexion, as might be expected, with the physical peculiarities of the country. The most striking circumstance noticed during a journey in Persia is the great prevalence of formations, such as gravel, sand, and clay, of apparently recent origin; the whole of the great plains covering at least one-half the surface of the country consist either of a fine, pale-coloured alluvial loam, which covers the lowest portion of the surface, or of gravel, fine or coarse, which usually forms a long gentle slope from the surrounding hills to the alluvial flat, and fills up with long slopes the broad valleys opening into the larger plains. All these deposits are more conspicuous than they are in most countries in consequence of the paucity of vegetation and the absence of cultivation throughout the greater part of the surface.

Nor is this prevalence of recent or subrecent detrital accumulations confined to the plains, for the slopes of the hills up to a considerable elevation are in some cases composed of similar unconsolidated formations, from which only occasional peaks of solid rock emerge. This, however, is by no means universally the case, many ranges consisting entirely of rock. Again, the descent in Balúchistán from the plateau to the sea-coast is over broad terrace-like flats of gravel and sand, separated from each other by ranges of hills running parallel to the coast line.

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[1] In a paper on the superficial deposits of Persia, published in the Quart. Jour. Geol Soc., xxix, p. 495, I spoke of the Sistán lake as differing from other Persian lakes by being fresh. I depended upon what appeared the latest information, but I find that Conolly, who had excellent means of observing, declared the water to be brackish. It probably is fresh only where rivers enter the lake, salt or brackish elsewhere.

The mountains and hill ranges of Persia comprise a considerable variety of geological formations, a few of which, however, prevail over large areas of country. So far as our knowledge at present extends, the great mass of the Zágros chain (the term being used in the widest sense for the whole mountain range from Mount Ararat to Shiráz, together with the numerous parallel minor ranges north-east of the main chain) consists of cretaceous (hippuritic) and tertiary formations, the former constituting the north-east half of the range and its slope towards the central plain of Persia, whilst the nummulitic and later formations prevail almost exclusively on the south-west watershed overlooking the Tigris valley. Older rocks occur, but they are of subordinate importance, and it appeared probable, both to Mr. Loftus and myself, that part at least of the altered rocks which form no inconsiderable portion of the range to the north-east is very probably of cretaceous origin. Old granite rocks, however, form a great band, extending from Lake Urumiah to a point nearly due west of Isfahán, and the same crystalline masses appear in the ranges between Isfahán and Káshán.

The Zágros range runs very nearly from north-west to south-east, and it is shown by Loftus to consist of parallel bands of rock having the same stripe as the chain. The same general direction prevails in the ranges which traverse the country between Isfahán, Yezd, and Karmán, and a continuation of which extends as far south as the neighbourhood of Bampúr and Jálk, in Balúchistán. In fact, it may be said to characterise all the mountains south-west of the great central desert of Persia, and forming a belt of more or less hilly country intervening between those deserts and the great depression of the Persian Gulf and the Mesopotamian plain. So far as these north-west-south-east ridges have been examined, they have the same geological features as the Zágros, and consist similarly in the main of cretaceous and nummulitic rocks, the former prevailing to the north-east towards the desert, the latter to the south-west near the sea. Here, again, metamorphic rocks occur, some of them granitic, others but little altered, and closely resembling in facies the cretaceous beds in their neighbourhood. Volcanic formations also occupy an extensive area, and whilst some appear of very late origin, others are possibly contemporaneous with the cretaceous epoch.

Along the south-western edge of the Zágros range there is a great development of tertiary formations newer than the nummulitics. The precise position of these beds in the geological sequence has not been determined, and they may comprise representatives of both the Miocene and Pliocene ages. By Mr. Loftus they have been classed under the general designation of the Gypseous series.

The southern border-land of the Persian plateau has not yet been sufficiently examined for its geological characters to be well known. Where crossed by Major St. John and myself, between Gwádar and Jálk, it consisted of low ranges running east and west, and, except near the sea, almost entirely composed of unfossiliferous sandstones and shales, associated with a few beds of nummulitic limestone. So far as could be ascertained, these ranges appear to belong entirely to the older tertiary epoch. Here and there a few isolated masses of basaltic igneous rock have been intruded through the strata, but their occurrence is exceptional. Along the sea-coast, however, from the frontier of Sind to the Persian Gulf, and probably throughout a large portion of the north-east shores of the Gulf, a newer series of rocks rests upon the nummulitics. This newer series is easily recognised by the presence of thick beds of hardened clay or marl; it is of great thickness, and abounds in fossils, a few of which appear to be living forms, whilst others are extinct. The exact age has not been ascertained; the mineral character is very different from that described by Loftus as characteristic of the gypseous series, and it is therefore premature to class these beds of the Persian coast, for which I have proposed the name of Makrán group, more definitely than as newer tertiaries. It is highly probable that they represent a portion at least of the gypseous series. Along the coast itself are a few mud volcanoes.

But very little is known of the eastern and north-eastern frontiers of the Persian table-land. In Kalát, on the Bolan Pass, and in the Sulaiman ranges, nummulitic rocks are known to be largely developed, and strata of older date were found by Dr. Cook in Kalát [1], but the hippuritic limestone, so greatly developed in Southern Persia, has not yet been noticed on the eastern borders of the country.

North-western Persia, on the other hand, has been widely explored by various Russian and German travellers, and there would appear, both in Adarbaiján and the Elburz range, to be a greater development of older Mesozoic and Palæozoic formations than in other parts of Western or in Southern Persia. From the very brief visits which I was enabled to pay to the Elburz and the small area examined, I can form but an imperfect conception of the range as a whole, but the impression produced by my visits is that the geological composition of this mountain chain presents a striking contrast to that of all other parts of Persia which I had previously seen. It appears probable that a very considerable portion of this range consists of carboniferous and Devonian beds, and that Jurassic or Liassic rocks are also extensively developed. The same formations extend to Adarbaiján, but here, as well as in the eastern parts of the Elburz, cretaceous and nummulitic rocks are also found. Metamorphics (granite, &c.) exist in several places, whilst volcanic outbursts occupy a considerable area, and the highest mountain in Persia, Damávand, in the Elburz chain, about 60 miles east-north-east of Tehrán, is a volcano which, although dormant in the historical period, is of recent formation, and still gives vent to heated gases. The volcanic masses of Ararat Sahend, south of Tabriz, and Savalán, are also in great part at least of geologically recent origin.

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[1] Jour. Bombay, Branch Roy. As. Soc., vi, p. 184.

The following is a list of the formations hitherto noticed in Persia, followed by a few details as to their known mineral character and distribution.

QUATERNARY OR RECENT:—
- 1. Gravel, sand, clay, &c., of the desert plains and valleys. Calcareous conglomerate of the coast. Alluvium of Mesopotamia. Subrecent volcanic rocks.

TERTIARY:—
- * *Newer.*
  - 2. Makrán group.
  - 3. Gypsiferous series. (?) Salt beds of Hormúz, &c., older.
  - 4. Nummulitic series.

SECONDARY:—
- 5. Cretaceous series. Hippuritic limestone. (?) Volcanic beds of South-western Persia.
- 6. Jurassic and Liassic beds.

PALÆOZOIC:—
- 7. Carboniferous and Devonian.

METAMORPHIC:—
- 8. Granite, Gneiss, &c.

In treating these formations it is most convenient, as usual, to commence with the oldest.

8. METAMORPHIC ROCKS, INCLUDING GRANITE.

As has already been mentioned, these occupy a considerable area in the Zágros range, extending from Mount Ararat nearly to Isfahán; they occur in several scattered localities in North-western Persia, in the mountains north of Tabriz, and near Sainkála, between Sultániah and Kazvín. By Grewingk they are also marked as existing in several places on the lower ranges in Ghilán south-west and south-east of Resht, and some slaty rocks, perhaps schistose, occur near Astrabád.

The only place where granitic rocks were crossed in my journey through Persia was at Kohrúd, between Isfahán and Káshán, where they form the steep scarp facing to the north-east of a high range, about 8000 to 9000 feet above the sea. Similar granitoid formations were, however, proved to exist in the lofty range called the Kúh-i-Sháh-Sowárán, lying south of Bam, and forming the south-western limit of Narmashír, for large pebbles of granite and similar rocks abounded in the streams running from the range, which was of sufficient altitude to be thickly capped with snow in April.

Besides these more granitoid metamorphic rocks, there is a large extent of more or less altered slaty and sandy beds, occasionally schistose, and of limestones which were seen in Sarján, between Karmán and Shiráz, near the town of Saidabád, and again between Asupás and Yazdikhást on the road from Shiráz to Isfahán. In the former case the alteration appears greater than in the latter; near Saidabád the hills consist of crystalline limestone associated with mica schist, quartzite, and gneissose rock. Nevertheless, except in the crystalline structure, the resemblance to the cretaceous beds of Karmán is so great that it appears highly probable that these altered rocks belong to the same formation. In the case of the rocks near Kushkizard and Dehgirdù between Shiráz and Isfahán, the change has been less, and the evidence of the altered beds being in part at least cretaceous is stronger because they appear to pass into hippuritic formations south of Asupás and near Yazdikhást.

Similar slaty and schistose rocks are shown by Loftus to have a wide range in the Zágros, extending in the neighbourhood of the granitic rocks from a little south of Lake Urumiah to the plain of Persepolis, and he likewise remarked the resemblance of portions of them to the beds of the cretaceous formations[1]. The altered beds of Sarján are on the strike of the same band of rock, and the granitoid mountains forming the range of Kúh-i-Sháh-Sowárán are very little to the north-east of the same line, so that it appears far from improbable that the great band of granitoid gneissic schistose and slaty rocks extending from Mount Ararat to the borders of Balúchistán, a distance of considerably more than 1000 miles, is continuous, and that its metamorphism is of the same age. That age moreover is not older than cretaceous, if, as appears probable, a portion at least of the altered beds both south-west of Karmán and north of Shiráz represent the hippuritic limestone, and it is difficult to avoid the conclusion that the metamorphism of the band of rock mentioned is connected with the volcanic formations which in places appear to be associated with the cretaceous beds[1]. It should also be remembered that Abich has pointed out, in the Caucasus, evidence of great volcanic outbursts towards the close of the cretaceous period.

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[1] Loftus is inclined to refer a large proportion of these rocks to altered nummulitics, Q. J. G. S., xi, p. 280, but he admits that a portion of them are older, and that their appearance is very different from that of the usual tertiary rocks. A glance at Loftus's sections, especially fig. 1. p. 326, and fig. 10. p. 333, will show the greater probability of the altered rocks belonging to the cretaceous than to the nummulitic formations. These sections are very similar in general character to some between Shiráz and Karmán.

7. PALÆOZOIC.

In Southern Persia no fossiliferous rocks are known of older date than the cretaceous period, but the age of the salt rocks of Hormúz and the other islands in the Persian Gulf has not been ascertained, and they may be ancient, though it is more probable that they are tertiary. In Northern Persia there is a great development of Devonian and carboniferous rocks in the Elburz, extending north-west to the valley of the Araxes, where they have been found by Abich around Julfa, north-west of Tabriz. The only locality in the Zágros chain at which palæozoic formations have been detected is in the Bakhtiyári mountains, on the east side of the Kúh-i-Kellár range, about 50 or 60 miles south-west of Isfahán. Here Mr. Loftus observed some highly crystalline grey limestone containing a species of *Orthis* considered by Mr. Morris as a form intermediate between a Devonian and Silurian species. It is not impossible that the rock found may be of the same age as the Devonians of Northern Persia, but this is only a suggestion.

In the only case in which an opportunity occurred for examining the Palæozoic formations of the Elburz, which was close to the town of Anán, due north of Tehrán, I found very thick beds of carboniferous limestone, containing *Productus giganteus* in places, and precisely similar in character to the mountain limestone of the west of England, associated here and there with shales, which were more or less carbonaceous. In some of these shales I found several fossils, especially *Streptorhynchus crenistria*, *Spirifer*, sp., *Spiriferina*, sp., and two species of *Retepora*, which Mr. Etheridge, to whom I am indebted for the names, considers Devonian. So far as I could judge from a very hasty examination, the shales in which the fossils occurred were not only interstratified with the *Productus* limestone, but they were high up in the series; the sections were finely seen in an immense gorge in the mountains, and although I tried to detect evidence of faulting, I could see none. From the accounts given by Abich and Grewingk, it appears that similar associations of *Productus* limestone, with beds containing Devonian fossils, are found elsewhere in Northern Persia.

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[1] These remarks do not apply to the granite and gneiss of Kohrúd.

SECONDARY.

6. Liassic and Jurassic.

These lower secondary formations, like the Palæozoic, have not hitherto been recognised in Southern Persia. Mr. Loftus points out that some of the altered rocks of the Zágros range are probably of older secondary age, and he describes a limestone occurring at Miám Mir Achmet, between Básht and Fáliyan, north-west of Shiráz, containing *Ammonites Gryphæa Voluta* and other fossils, as of this date. The species of fossils are not mentioned, but the occurrence of *Voluta* tends to induce the belief that the strata are more recent than the Jurassic epoch, and the beds are said to pass upwards into a hard yellow compact and crystalline limestone, which Mr. Loftus is inclined to refer to the Nummulitic group[1], so their lower secondary age is by no means clearly proved.

Marine Jurassic rocks are said by Grewingk to be found in the Araxes valley and in Ghilán, but he has included Hippuritic limestones, and it is far from clear that all the rocks described are not cretaceous. Abich describes the occurrence of Jurassic formations in the Caucasus and in Karabágh, and indicates a probable locality south of the Araxes, but does not prove their existence in Northern Persia.

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[1] The description agrees better with the Hippuritic limestone, so far as my observations of the two rocks extended, and I think Mr. Loftus has in several cases included cretaceous limestones which are frequently very unfossiliferous in the Nummulitic group.

There is, however, in the Elburz mountains a widely-spread formation containing fossil plants of unquestionable lower secondary age, and beds of coal. The principal fossils are species of *Pterophyllum*, *Palæozamia*, *Nillsonia*, *Odontopteris*, etc. The same rocks with similar fossils have been traced far into the Caucasus by Abich. It is not quite clear whether all the coal beds of the Elburz are of this age, nor whether the greenish and grey shales and sandstones so largely developed just north of Tehrán should be referred to the Jurassic formation; but this is far from improbable.

5. CRETACEOUS SERIES.

Rocks of cretaceous age occupy an extensive area in South-western Persia, and it appears probable that a very large portion of the plateau is covered with formations belonging to this epoch. The most conspicuous member of the series is massive limestone, usually compact, but sometimes crystalline, whitish, pale yellow, pink, grey, or slaty in colour, the pale tints predominating. The peculiar compact texture, fine grain, and conchoidal fracture of the most common variety of limestone are characteristic, and the form of the hills composed of it is equally so: it weathers into rounded bosses, with a very pale-coloured surface. In places this limestone abounds in *Hippurites*.

With the limestone, sandstones and shales are associated, usually in rather thin beds, but often attaining a considerable thickness. The whole series near Karmán, where it is well developed and consists chiefly of limestone, appears to exceed 8000 feet in thickness, and neither the top nor base is seen.

Cretaceous rocks are shown by Loftus to extend throughout, or almost throughout, the Zágros range from a little south-west of Lake Urumiah to Persepolis; and I have traced them to the south-west, apparently without interruption from this point north of Shiráz to about half-way between Karmán and Bam, so that they occupy an unbroken, or almost unbroken, tract from north-west to south-east, at least 800 miles in length. This, however, only gives a partial idea of their range. Loftus frequently mentions his impression that some of the limestones classed by him as Nummulitic are really cretaceous;

and amongst the formations of doubtful age marked in his map as 'Blue Limestone and Slate Rocks,' I found what appeared to me unmistakeable Hippuritic limestone in several places on the road between Shiráz and Isfahán. The limestones near Isfahán, south-west of the city and the hills north of the Bandámír valley, near Persepolis, are both marked as Nummulitic by Loftus, but appeared to me probably cretaceous, and in the last-named locality I found *Hippurites* in places. Moreover, many of the isolated masses of limestone seen on the road from Isfahán to Tehrán had precisely the same character as the Hippuritic beds of Karmán, and in some blocks of limestone brought from a hill a few miles east of Tehrán for building purposes I found *Hippurites* in abundance. According to Grewingk, cretaceous beds occur in the Elburz, and in Adarbaiján they were detected by Hommaire de Hell near Astrabád, and they are well known to be largely developed in the Caucasus and in Asia Minor. Thus the Persian rocks of this epoch are in connection with those of southern and south-eastern Europe.

The south-eastern limit of the cretaceous area is not well ascertained. Fossiliferous limestones were found as far as Khúsrín, about half-way between Karmán and Bam, but some sandstones and shales very probably belonging to the same series as the limestones extended along the south-western side of the Bam valley to the neighbourhood of that town, and limestones of unknown age, but possibly cretaceous, were observed on the northern margin of the Bampúr plain.

Besides the sedimentary rocks of undoubted cretaceous age, there are in several parts of Persia volcanic rocks, chiefly dolentes and ash beds, often associated with gravels, conglomerates, and sandstones of unmistakeably aqueous origin, which appear in places so closely connected with the cretaceous series that their contemporaneity seems highly probable. Here and there, as near Karmán, volcanic rocks are found apparently intercalated amongst cretaceous strata, and as Abich has pointed out that great outbursts of volcanic rocks took place in the Caucasus towards the close of the cretaceous epoch, it appears highly probable that a portion at least of the widely-extended volcanic formations of Southern and South-western Persia should be referred to the same geological period. At the same time some of the igneous rocks are probably newer, for the volcanic cones of the Elburz are of comparatively recent date, as are also those of the country between Bampúr and Narmashír, on the frontier of Balúchistán, whilst the basaltic outbursts seen in Balúchistán itself are intruded amongst the nummulitic rocks.

Another circumstance which tends to render probable a late cretaceous or post-cretaceous date for some of the volcanic outbursts is the circumstance that some of the altered rocks, as for instance those of Sarján and those of Asupás, appear to be of cretaceous age. These have already been described under the heading of metamorphic rocks.

If we include the volcanic rocks, whether associated with sedimentary beds or not, in the formations to be ascribed to the cretaceous period, it is evident that strata belonging to this series occupy all the area of Western and South-western Persia, where rocks have been detected from the outcrop of the nummulitics along a line drawn south-west of the principal axis of the Zágros range to the borders of the interior deserts, and from the base of the Elburz to Balúchistán. It becomes highly probable that similar rocks extend far into the central deserts, and probably cover a very large portion of the plateau.

TERTIARY.

4. Nummulitic Series.

Like the cretaceous rocks, the nummulitic beds are found in the extreme north-west of Persia, and extend thence throughout the whole of the Zágros range to Shiráz. Their presence in Adarbaiján and the Elburz has been shown by various observers. I met with them around Shiráz, and in the country intervening between the lakes of Shiráz and Níríz, but the whole journey from Bam to Níríz was over older rocks. Throughout the area traversed between Gwádar and Jálk, and from Jálk to Bampúr, in short, during the whole of the journey in Balúchistán, the only fossiliferous beds observed, except in the neighbourhood of the coast, were nummulitic limestones, and from the mode of association of the sandstones and shales which occupy the greater portion of the country with the limestones, there appears no reason for separating the two. Still no proof of their identity has been found beyond conformity in a much disturbed area, where nearly all the beds are vertical.

Whether the Balúchistán nummulitics are connected with those of

Shiráz it is impossible to say, but it is far from improbable that a continuous belt of formations of this age extends parallel to the coast and joins the two tracts. It appears highly probable that the nummulites of Dizak and Píshín are a portion of the Kalát and Sind area, which again is joined to that of the Panjáb and Afghánistán, so that the plateau of Persia is surrounded on three sides, west, south, and east, by older tertiary formations. At the same time there appears to be a want of tertiary beds on such portions of the Persian plateau as have hitherto been examined[1].

The nummulities near Shiráz consist chiefly of limestone, with a few bands of sandstones and sandy shales intercalated. The limestone is sometimes compact, but often in thin beds, decomposing into loose irregular blocks. So far as it was observed, it never occurred in such compact masses as are characteristic of the Hippuritic limestone, the strata were thinner, and there was a far greater tendency to decompose into loose blocks on the surface. More compact limestones, however, are described by Loftus as occurring in the Zágros, and near Shiráz and Níríz fragments of a very homogeneous grey limestone, abounding in *Alveolinæ*, were seen, resembling the fine-textured limestone, containing the same fossil, in Sind and Balúchistán. In one place east of Sarvistán, a great thickness of red shales and variously coloured sandstones is exposed, which apparently belong to the nummulitic series, although their relations are obscure. Somewhat similar beds are seen at the base of the Hippuritic limestone cliffs near the town of Níríz.

So far as can be judged from Loftus's descriptions and detailed sections, the nummulitic rocks of the Zágros closely resemble those of Shiráz, and consist chiefly of limestone of various colours, often compact and crystalline.

The rocks of Balúchistán are very different. They consist chiefly of shales and thinly-bedded sandstones, grey, greenish grey, brown, or slaty in colour, with occasional beds of harder sandstone. In some places they are much hardened, and become slaty, well-marked cleavage being developed in one or two instances, and even incipient foliation. At a few localities, as about Hung, north of the Píshín

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[1] As already noticed, Grewingk states that Nummulitic limestone occurs near Yezd. This however, like the asserted occurrence at Kohrúd, needs confirmation, it being possible, unless the fossils were carefully compared, that some of the Hippuritic limestones were taken for Nummulitic.

Valley, near Dizak, and near Magas, compact grey and whitish limestones containing *Nummulites* and *Alveolinæ* occur, usually in small isolated masses, but near Magas forming a high range of hills. These limestones, although not in continuous bands, recur along the same strike, the Magas rocks being on the general strike of those seen between Píshín and Hung.

The most curious point connected with all these Balúchistán beds is that, throughout the whole area traversed, they dip at excessively high angles, being very often vertical, or nearly vertical, for miles together. A great thickness of beds must be exposed, and the question arises whether all are nummulitic, or only those associated with the limestones. But there is no difference in mineral character between any of them, indeed the similarity throughout is most marked, and, although it is quite possible that different formations may occur, no way of distinguishing them was detected.

3. GYPSIFEROUS SERIES.

No opportunity was afforded of studying these rocks during my journey through Persia. The name was applied by Loftus to all stratified deposits above the nummulitic limestone. The beds thus named are of great thickness, and their exact geological horizon, owing to the paucity of fossil evidence, is not determined. They are doubtless newer tertiary, but whether Miocene or Pliocene is uncertain.

These beds, according to Loftus, occupy the whole outer slope of the Zágros range, and are found locally in the plains of Mesopotamia. They nowhere are known to exist on the inner or north-eastern slope of the Zágros; they have been traced from Mosul, on the Tigris, to Kázrún, west of Shiráz, but are not known with certainty farther to the south-east, nor is it by any means clear whether they are represented partly or wholly by the Makrán group.

The general section of the Gypsiferous series is said by Loftus to be—

1. Fine gravel, passing into
2. Friable, red, calcareous sandstone.
3. Variegated marls, frequently saliferous; with vast deposits of gypsum, and thin beds of impure limestone.

There is a bare possibility that the salt rocks of Hormúz, Larak, Kishm, and other islands of the Persian Gulf may represent the Gypsiferous series. Certainly the beds in question have a very ancient appearance, but this may be due to the association of volcanic rocks. Salt occurs in the Gypsiferous series, though not in the same abundance as in the Hormúz beds, but the latter resemble the former in several peculiarities of mineral character, such as the presence of gypsum.

As regards the age of the salt-bearing beds, all that has been ascertained is that the newer tertiary Makrán beds rest unconformably upon them, and that they are greatly disturbed. Still the nummulitics in Balúchistán are just as old-looking and are found vertical over an enormous area.

The salt formation consists of beds of rock-salt more or less pure, frequently mixed with reddish clay interstratified with shales and sandy beds, often of bright red and reddish brown colours, and with volcanic rocks, dolerites and trachytes. Micaceous and specular iron ore and iron pyrites are associated, and gypsum and sulphur are said to occur. The quantity of rock-salt in some places is enormous; at Hormúz it appears to equal or exceed in amount all the other constituent parts of the formation together, but it is not extracted in any large quantity.

The appearance of these rocks from a distance is very characteristic, owing to the rich red and brown colours assumed by them, and to the singularly craggy appearance produced by the solubility of the salt. The formation appears to occur in all or nearly all the islands of the Persian Gulf, those near the Persian as well as those near the Arabian coast. It is also found at a few places on the Persian coast, as at Rás Bostánah [1], south-west of Linga, and some other spots in the same neighbourhood [2].

2. MAKRAN GROUPS.

Throughout the Makrán or Balúchistán coast, from near the frontier of Sind to the entrance of the Persian Gulf, the hills and headlands are composed of a late tertiary formation, differing entirely in mineral character from the Gypsiferous series of Loftus, of which, or part of which, it may however be a marine equivalent. The distance from the coast to which this group extends is quite unknown, except near

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[1] This was not examined, but the rocks present the characteristic appearance of the salt-bearing beds.

[2] Compare Carter, J. A. S. B. 1859, xxviii, p. 44.

Gwádar, where it is found for about 20 miles inland before the Nummulitic formation crops out from beneath it.

I am disposed to think it probable that the rocks forming the hills along the north-eastern shore of the Persian Gulf belong to the same formation, and that it also forms the surface of many of the islands in the Gulf, resting unconformably upon the salt rocks just described.

For this formation I have proposed the name of the Makrán group[1], which may be retained until the position of the beds in the general series is determined. The prevailing rock along the coast is a pale grey clay or marl, more or less indurated, occasionally intersected by veins of gypsum, usually sandy, and often highly calcareous, occurring in beds of great thickness. With this, clay bands of shelly limestone, calcareous grit and sandstone are interstratified, but these usually form but a small portion of the mass, although their greater hardness makes them conspicuous at the surface. Inland, near Gwádar, the clays are less developed, and thinly-bedded sandstones are the prevailing beds.

Nothing accurate has been determined hitherto as to the thickness of the Makrán group, and very little can be stated as to any definite distinctions to be drawn between the different beds of which it is composed. From the sections exposed on the sides of the hill-ranges in Balúchistán, it is probable that not less than an aggregate thickness of 2000 or 3000 feet can be assigned to the group; probably this is much below the truth. From what little was seen of the basal portion near Báhú Kalát, where the Makrán beds rest upon the Nummulitics, it seems probable that the grey clays, with rather thick bands of calcareous sandstone, as at Gwádar, are the upper members of the group, that the sandstone beds become thin and much more numerous below, and at the same time less calcareous, whilst, still further down, sandstone predominates, and clay, if it occurs, is altogether subordinate. But it is not quite certain that the sandstones without clay are not nummulitic.

The rocks of the Makrán group are highly fossiliferous, but unfortunately the fossils have not hitherto been fully examined, and therefore all that can at present be said of their age is that they represent a portion of the later tertiary epoch[2]. From a cursory examination of some shells collected by Captain Stiffe, Mr. Etheridge thought that Miocene forms could be detected amongst them, but the same gentleman has very kindly examined a larger collection made at Gwádar by Dr. Day, to whom I am indebted for an opportunity of examining them, and he considers that the shells collected have a very late facies, and may even be Pleistocene. The following is a list of the forms included in Dr. Day's collection:—

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[1] Records, Geological Survey of India, 1872, v, p. 43.

[2] My own fossil collections from the Balúchistán coast and the Persian Gulf, containing many fine Echinodermata besides Mollusca, were sent to Calcutta in the hope that my late

Dolium, sp.
Natica Lamarckiana, or a closely allied form.
N., sp. small.
Cerithium torulasum L. apud Reeve.
Turritella, sp.
Fissurella, sp. near *F. italica* and *F. imbricata.*
Jouanettia (or Talona), near *J. Cumingiana.*
Sellina edentula, Spengler.
Venus, sp. near *V. plicata,* L., and *V. rugosa,* Chem.
Cytherea (meretrix), near *C. lyrata,* Desh.
Astarte ? sp. closely allied to *Circe corrugata,* Chem. I dredged this species living. Mr. Etheridge points out that it is nearer to *Astarte* than to *Circe.*
Diplodonta, sp.
Cardium, two sp., one near *C. papyraceum.*
Chama, sp. near *C. iostoma,* etc.
Chama (or Cleidothareis ?), sp.
Arca, four or five species—one of which is *A.* (*Parallelopipedum*) *tortuosa,* the others allied to various recent forms.
Pectunculus, two species, one allied to *P. pectiniformis,* Lamarck, the other allied to *P. lividus.*
Pecten, sp. somewhat resembling *P. pyxidatus.*
Ostrea, sp.
Temnopleurus, two sp.
Eupsammia, sp. (coral).
Meandrina, sp. (coral).
Operculina, sp.

The most characteristic and abundant fossils are the *Artarte,* allied to *A.* (*Circe*) *corrugata, Ostica, Pecten,* and *Balanus.* These appear to be almost always found where fossils are present. From the very small number which it has been found possible to identify with living species, although I have compared all carefully with the British Museum collections, I think an earlier age than Pleistocene must be assigned to the Makrán group, but before this and other tertiary for-

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friend, Dr. Stoliczka, would be able to examine them. His engagement with the Yarkand expedition, and his untimely death on his return journey, have prevented this, and I have not had time to obtain the fossils from India and examine them myself.

mations in Southern Asia can be correctly referred to their geological position, the whole series of tertiary beds and the recent fauna must receive more study than has hitherto been given to them.

1. QUATERNARY OR RECENT.

Under this general term I include all the surface accumulations of gravel, sand, and clay in the plains and valleys of Persia and on the hill slopes[1], the raised beaches or calcareous conglomerate occurring on the sea-shore, and the alluvial deposits of the Mesopotamian plains.

As has already been mentioned in treating of the general geological features, deposits of large and small pebbles, boulders, clay and sand, of geologically recent origin, and often of such thickness as to cover all other formations over hundreds of square miles together, cover an enormous area in Persia; probably more than one-half the surface of the country is occupied by them. In this prevalence of superficial deposits, and also in the forms they assume, there appears to be a great similarity between Persia and other parts of Central Asia, and throughout Turkistán, Afghánistán, and Tibet there is the same aridity, small rainfall, absence or scarcity of rivers, and paucity of cultivated land, combined with the same recurrence of broad desert or semi-desert plains, often without an outlet, surrounded by barren mountains.

The deposits in the central portions of the desert plains are usually a fine pale-coloured loam, often covered over by shifting sands. These fine deposits may be of lacustrine origin, for it is probable that lakes have once existed in the enclosed plains without outlets, which are now deserts. The surface appears flat, but there is probably in all cases an imperceptible slope towards the middle of the plain. The margins of the plains usually consist of a long slope composed of gravel and boulders, and with a surface inclination of 1° to 3°. Such slopes often extend to a distance of from five to ten miles from the base of the hills bounding the plain, the difference in level between the top and bottom of the incline being frequently 2000 feet or even more. What proportion of this depth consists of detritus it is impossible to say, but the depth of the deposit must be great, because hills of solid rock but rarely emerge from it. The pebbles and boulders are often angular or subangular, and mixed with large blocks sometimes two to three feet in diameter; all are derived from the neighbouring hills. Nothing resembling a beach deposit has been noticed in any case.

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[1] Compare Quart. Jour. Geol. Soc. xxix, p. 493.

From many of the desert plains valleys of great breadth extend into the more hilly regions. Along the sides of these valleys there are precisely the same slopes of gravel as on the margins of the plains. Several instances of these slopes will be mentioned in the subsequent pages; some of the most remarkable occur near Bam, Karmán, Káshán, and Tehrán. They are, however, ill marked or wanting near Shiráz, and appear not to occur in the valleys which contain running streams such as that of the Bandamír.

In many places, even at higher elevations than those of the desert plains, immense accumulations of coarse gravel are met with, covering the country, so that only the higher peaks rise above them. This was noticed between Ráyín and Karmán, and on the ranges between Karmán and Sarján. These high deposits may be, in part at least, glacial, but all the pebbles and boulders appeared to be rounded. In general these deposits are destitute of stratification, but sometimes they are distinctly bedded. In a few instances, as north of Ghistigán in Balúchistán, near Obárik[1] N. W. of Bam, and near Hanaka S. E. of Karmán, the beds of gravel have been greatly disturbed. At Ghistigán the disturbed beds may have been older than those of the plain, and perhaps represented the Makrán group, but elsewhere they appeared to pass into the horizontal undisturbed strata in the neighbourhood.

Terraces of gravel are a strongly-marked feature of the valleys and plains of Balúchistán. The valleys themselves are mostly flat, and frequently very broad, and on the flanks of the enclosing hills terrace above terrace is seen, frequently to a height of 100 feet above the present valley. These terraces are extremely irregular in height and size, they not unfrequently cap isolated hills in the middle of the valley (as in one instance close to Báhú Kalát, or along its edge), or they extend up the lateral valleys far into the hills, which are often not much higher. Frequently they are hundreds of yards broad, cut up by ravines and side valleys, and they consist of stones, sand, and clay, usually but little cemented together.

The formation of these terraces is well seen north and west of

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[1] Called 'Awárik' at page 195, vol. i.—*F. J. G.*

Píshín. A great part of the broad flat valley in which Píshín lies, five to seven miles across, consists of gravel washed down from the hills, the surface being nearly flat. This plain slopes away from the hills, the slope being rather sharper near the base of the latter, and there is a broad fan-shaped slope of detritus at the exit of each little ravine. The streams coming from the ravines spread themselves over the surface, distributing the gravel and sand washed down.

West of Píshín this plain is in places washed away near the Báhú stream, and its remains appear as a series of terraces, marking probably successive levels of the stream, which has gradually cut its way to a lower level.

Calcareous conglomerate of coast.

This is an impure loose-textured limestone, often closely resembling in appearance the well-known calcaire grossière, of which Paris is built, abounding in shells (often as casts only) and corals, the majority belonging to forms now common on the coast. It is said to be found at many places on the shore of the Persian Gulf, and at Bushahr it forms a low cliff and supplies the stone from which the town is built. The same is the case at Cape Jáshk, just outside the entrance to the Gulf. The same formation is seen on many of the islands in the Gulf, and is in some cases evidently a raised coral reef. It of course proves elevation of the coast in recent geological times.

A similar formation is common locally in Western India, as at Bombay, where Dr. Carter described it as 'littoral concrete.'

Alluvium of Mesopotamia.

The alluvium deposits of the Mesopotamian plains have been described by Loftus (Q. J. C. S. xi, p. 249), who divides them into fluviatile and marine, and shows that whilst the former are confined to the neighbourhood of the river, the latter cover an extensive area and extend at least 250 miles from the present northern termination of the Persian Gulf. The marine nature of these deposits is proved by their abounding in marine shells of species identical with those now living in the Gulf. The fluviatile alluvium 'consists of a stiff blue or fine arenaceous grey clay, and fine sand or gravel.' The marine beds are composed of 'dark grey or reddish-yellow loose sands and sandy marls.'

Subrecent Volcanic Rocks.

It is only necessary to mention these in order to point out their distribution. Volcanoes have existed in recent geological times in North-western Persia, and on the South-eastern frontier, close to Balúchistán.

The principal volcanoes of North-western Persia are Mount Ararat on the frontier, Sahend, south of Tabriz, Savalán, east of Tabriz, and Damávand, north-east of Tehrán. As I have not been able to visit any of these mountains I can add nothing to the descriptions of them given by other travellers.

In South-western Persia are the Kúh-i-Basmán and Kúh-i-Naushâda north of Bampúr, and several small craters a little farther west on the edge of the Narmashír desert[1].

In conclusion a brief attempt may be made to show what has been the probable geological history of Persia during the later mesozoic and tertiary periods. It has already been shown that we have only fragmentary records of the earlier formations, and that so far as the country has been examined, they are only known to be represented in the region south of Adarbaiján and the Elburz range by a few local representations in the Zágros mountains.

It is evident that during cretaceous times the greater portion and probably the whole of Southern and South-western Persia was beneath the sea. We know that at this period there was a great development of land in what is at present part of the Indian Ocean south of Persia and Arabia, and that very probably land communication existed between India and Africa. Towards the close of the cretaceous epoch a great change took place accompanied by volcanic outbursts in the Caucasus, over a great area in Western India[2], and probably in several parts of Persia, and the result was the elevation of the Zágros range, and perhaps of the country now forming the Persian plateau. Unless the asserted existence of nummulitic rocks near Yezd and Kohrúd be confirmed, there is no evidence at present that the Persian highlands have been submerged since the close of the mesozoic epoch.

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[1] Mud volcanoes, as they are called, abound on parts of the Balúchistán coast east of the Persian frontier, but I do not know of any occurring in Persian territory. Still it is by no means improbable that some may occur. I do not consider those I have examined as having any connexion with true volcanic action, they are caused by evolution of gas, apparently light carburetted hydrogen through beds of clay; the water brought up with the gas forms mud, which is ejected.

[2] I have pointed out that the age of the Deccan and Bombay traps of India is approximately later cretaceous memoirs, Geological Survey of India, vol. vi, p. 159.

The south-west slopes of the Zágros and the country on the coast of the Persian Gulf and Arabian Sea were however still beneath the ocean in early tertiary times, and the nummulitic sea extended far to the eastward along the southern slopes of the Himalayas, and very possibly occupied the plains of Northern India and the Panjáb. It certainly covered nearly the whole, if not the whole, of Balúchistán and Sind. To what extent elevation took place at the close of the eocene epoch and previous to the deposition of the gypsiferous and Makrán beds is not clear, but it is evident that in later tertiary times the shores of the Indian Ocean were further north than they are at present, and it is probable that the north-east coast of the Persian Gulf was also under water. Up to a very late period also the Gulf extended far into Mesopotamia. It is probable that this extension of the Persian Gulf was contemporaneous with the existence of a great inland lake covering the Aralo-Caspian plain north of Persia, and extending west to the Danube, and it is only reasonable to conclude that Persia and the neighbouring countries enjoyed a much damper climate than at present[1].

It is probable that at this time the plains of Persia, now flat deserts, were covered by lakes, some and perhaps all of which were salt or brackish. It is the deposits in these lakes which have formed the deep accumulations of sand and clay, the surfaces of which now form the desert plains occupying so large a portion of the country. Previously, however, to the formation of these lakes, the plateau of Persia must have been cut into river valleys, for the rocks which once filled the depressions of the present desert basins must have been cut out by the action of rain and running water, and the detritus carried to the sea. It may perhaps have been the same elevatory movements which converted the seas of the Makrán period into dry land and dammed up the outlets of the river valleys, and it is far from improbable that already a diminution of the rainfall, to which the valleys owed their origin, had taken place, and that the water flowing down the river channels no longer sufficed to cut down the obstacles presented by the elevation of the lower portion of the stream beds. The outburst of volcanoes in Northern Balúchistán was perhaps synchronous with the elevation just mentioned.

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[1] I have entered somewhat into this question in a short paper, already quoted, Quart. Jour. Geol. Soc. 1873, vol. xxix, p. 500. For information on the Aralo-Caspian area the following works may be consulted :—

Murchison, de Verneuil and von Keyserling, 'Russia and the Ural Mountains,' i, pp. 297–325.

Humboldt, 'Asie Centrale,' ii, pp. 121–364.

Von Baer, 'Caspische Studien,' Bull. Soc. Imp. Sci. St. Pet. xiii, 1855, pp. 193, 305; xiv, 1856, p. 1; xv, 1857, pp. 33, 65, 81, 113, 117.

De Filippi, 'Viaggio in Persia,' pp. 303–325.

As the rainfall farther diminished, the lakes gradually dried up, and the streams which had formerly carried down the detritus of the hills now only transported such debris as rain and frost detached from the surface to the base of the incline, where it formed a long slope of gravel and sand such as we now see on the edges of the deserts. That a paucity of rainfall is the cause of these enormous slopes of gravel appears probable from the fact that similar accumulations appear throughout the world to be characteristic of comparatively dry climates. But the regions in which such accumulations are found must once have engaged a larger rainfall, or the valleys and basins now being filled up could never have been formed[1].

Of glacial action in Persia there is, perhaps, a trace in the thick gravel found locally, as near Karmán, on ranges of considerable height. At the same time no clear evidence of inaction could be detected. In the Elburz mountains, which are in about 36° latitude, neither De Filippi nor I could find any evidence of former glacial action. It is true that neither of us had much opportunity for exploring, but it is remarkable that Abich should have called attention to the same absence of glaciation in the Caucasus.

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[1] My brother, Mr. H. F. Blanford, has suggested to me that the greater humidity of Persia and the neighbouring countries in former times may have partly accounted for the former great extension of glaciers in the north-west Himalayas. If the west wind so prevalent in North-western India were moist, instead of being hot and dry as it now is, there would be certainly a great increase in the deposition of snow on the Western Himalayan ranges.

PART II.

DESCRIPTION OF ROCKS SEEN ON JOURNEY.

1. *Gwádar to Jálk.*

The whole coast of Balúchistán, from near Cape Monze west of Karáchí to the entrance of the Persian Gulf, appears, so far as could be judged from its aspect when viewed from the sea, and its cursory examination at Rás Malán, Pasní, Gwádar, Chåhbár, and Jáshk, to consist of one group of rocks, which I have called the Makrán group, from the name commonly applied to the coast and the country adjoining it. This group of beds is elsewhere described generally; near Gwádar it is, as usual, represented by thick beds of pale grey clay, more or less indurated with layers of calcareous conglomerate, grit, and sandstone.

Gwádar is situated on a low sandy isthmus, not half-a-mile broad at the town, with a deep bay on both sides. No rocks are seen in this isthmus, which unites with the mainland a peculiarly-shaped flat-topped headland, 9 miles long from east to west by 2½ miles broad, its greatest length being thus parallel with the general direction of the coast line. It is composed of the usual clays, with bands of calcareous conglomerate, hard layers of which form the upper surface. A few large oysters occur in the conglomerate, and in some of the clay beds, *Cerithium*, *Turritella*, *Foraminifera*, and *Balani* are found.

The road taken, after leaving Gwádar, runs west not far from the coast, to the neighbourhood of Gwatar Bay. The country near the sea consists principally of a flat sandy plain, covered in parts by hillocks of blown sand. At Ankora, 12 miles from Gwádar, a small stream, containing brackish water, is crossed. The tide rises as far as the crossing place. On the banks of this stream, a few feet above high-water mark, are beds of marine shells, *Dosinia*, *Arca*, *Conus*, *Natica*, etc., in loose argillaceous sands, several of the species, and perhaps all, being those now common on the coast. This bed is evidently a sub-recent formation, and probably a form of the coast deposit, which, at Jáshk and elsewhere, takes the shape of a shell limestone. Fragments of a bed containing recent shells, and apparently belonging to the same formation, are common on the shore at Gwádar, but their origin was not ascertained. Such beds, wherever they occur, afford evidence of a rise of land along the coast at no distant geological period, and similar evidence has been noticed at several spots along the coast of Persia, Balúchistán, Sind, and Kathiawár, and also at Bombay.

From Ankora to Falari, and thence to the Dásht river, the road, which is along the line of the telegraph, traverses a flat plain of sandy clay. Rocks of the Makrán series crop out to the north of the road as far as Falari, and here and there farther west. There are also hills on the sea-coast in places. The dip, near Falari, is a little east of south. Some *Turritellæ* occur in these beds.

In the stream at Falari there are large pebbles of nummulitic limestone, but these, as well as rounded fragments of a basaltic rock found scattered about the plain, are probably derived from the conglomerates of the Makrán series. Beds of marine shells are scattered here and there about the plain near Falari, affording additional evidence of recent elevation above the sea.

The Dásht river runs through a very large plain, so perfectly flat as to become almost covered with water in heavy rain. The Darabal hills near Gwatar Bay rise from the middle of this plain. They consist of sandy clay and sandstone dipping in various directions at rather high angles.

After crossing the Dásht river, the road from Gwádar to Báhú Kalát enters the hills on the west side of the plain at a place called Samán. The rocks of the hills between this place and Báhú Kalát are very similar to those of Darabal hill, pale-coloured clay, with numerous thin bands of rather flaggy soft sandstone, often more or less calcareous. All the ranges have a peculiar dusky appearance, or, in strong sunlight, reddish brown, owing to their surfaces being covered by fragments of the sandstone, left behind when the soft clays are washed away by rain. The dips of the rocks are very variable, but usually high. West of Samán, however, the beds are nearly horizontal over a considerable area.

Approaching Báhú Kalát, a change takes place in the character of the rocks, and thick bands of sandstone, greenish or pale brown in colour, are met with, whilst the clays become less abundant. Owing to the great disturbance to which all the beds have been subjected, their sequence is far from clear; but it appears, on the whole, probable that these sandstones are lower in the series than the beds in which the clays predominate, as near Gwádar.

The low hills, five miles north-west of Báhú Kalát, consist of thin layers of sandstone, some of which is argillaceous, but there is no absolute clay; these beds appear to dip under massive sandstones, like those seen a few miles to the south-east; but the large hills farther to the north-west, the Peteh Kúh, consist of thick clays, with hard dark-coloured bands, apparently of sandstone, like the rocks of Gwádar. The beds of the Peteh Kúh have the appearance of resting unconformably on the sandstones near Báhú Kalát, and it is possible that this really is the case, and that the Báhú Kalát rocks are nummulitic; but there is so much disturbance that a closer examination than time permitted would be necessary in order to determine this question.

From Gwádar to Báhú Kalát the road followed had a general direction to west-north-west, but at Báhú Kalát we turned to the northward, and thence to Jálk; our line of march was on the whole nearly north, though with many local windings.

About six miles north of Báhú Kalát, on the road to Píshín, the low hills consist of greenish grey sandstones and sandy shales, much disturbed and forming sharp anticlinal curves. Here again the clays, also much disturbed, appear to rest on the sandy beds, but there is no marked unconformity, at least none could be seen on the road. At the same time some hills to the north and north-west, called Do-brádar (two brothers), consist evidently of Makrán beds, the thick clays being conspicuous, and these beds appear to be lying at very low angles, and quite unconformably to the much contorted and almost vertical beds traversed on the banks of the Báhú river. On the whole I think it probable that the rocks seen between the Báhú river and Kastag are nummulitic, but the age of those met with about Báhú must remain undecided. There can be no hesitation in classing the rocks traversed between Kastag and Píshín with the nummulitic series. So far as could be determined, the Makrán beds extend farther north to the east of the Báhú river than they do to the west.

About four miles south-west of Kastag there is an isolated crag called Kúh-i-Siyáh or Siyáh Kúh (the black hill). It consists of brown and greenish amygdaloidal dolerite, sometimes passing into true basalt, and is part of a dyke-like intrinsic mass running in a general direction from north-east to south-west, and greatly altering the sandstones and shales in contact with it. The small vesicles in the amygdaloid are filled with zeolites, and they are lined with a crystalline silicate of iron.

From a little north of Kastag to Píshín the rocks traversed consist of very fine grey shales and sandstones looking much older than the beds seen immediately to the south, but this appearance of age is probably due to pressure and disturbance; in composition the rocks appear very similar to the sandy shales and sandstones of Báhú, except that they are more argillaceous. Occasionally thicker sandstones are met with, exhibiting a strongly-marked nodular or concentric structure; and the same is sometimes seen in the shales. All these beds are vertical, with a very regular east and west strike changing to a little south of west near Píshín. No fossils were noticed in these or in similar beds throughout Balúchistán.

Píshín lies in a broad valley plain, about eight to ten miles across from north to south, and extending considerably more than 100 miles from east to west. So far as it was examined, it appears to be entirely covered with gravel and sand. Terraces of older date are strongly marked along the edge of the plain, both here and further south along the edges of the Báhú valley; indeed they form a conspicuous feature throughout the portion of Balúchistán traversed.

The long Píshín and Mand plain is bounded both on the north and south sides by ranges of hills, the former being much the higher, but it does not form the valley of a stream. The streams which run into it from the north follow its general direction for a distance, and then break through the low range to the south. Its present form is evidently due to some other agency than that of the existing rivers, nor does it look much like a valley of sub-aërial denudation. It forms, in fact, one of a series of step-like terraces by which ascent is made to the highlands of Balúchistán, and these plains may mark different sea-levels during the elevation of the country above the sea. The gravels, however, which cover the plain appear, so far as they could be examined, to be sub-aërial, and no marine beds were noticed.

A section of these gravels, about 150 feet thick, is exposed about ten miles west of Píshín, where the Báhú river cuts its way through steep cliffs, entirely composed of pebbles and sand. On each side terraces rise till they attain a height of 400 or 500 feet above the river. All this thickness consists of similar deposits. Throughout the plain, so far as it was traversed, no rocks occur; the surface is covered with sandy clay towards the middle of the valley, and with pebbles near the hills.

The hills at the eastern extremity of the Bagarband range, sixteen miles west of Píshín, consist of shales and sandstones similar to those seen at Píshín. The higher portion of the range appears to be formed of horizontal beds of massive sandstone, with softer bands intercalated. Time did not allow of an examination of these, but the blocks which had fallen from above consisted of sandstone very similar to that occurring below. Still the massive beds appear, when viewed from various directions, horizontal, and quite unconformable to the nummulitics at the base, which are, as usual, turned on end and contorted. The upper beds do not resemble the rocks of the Makrán group, but it is probable that they must belong to the lower portion of it, unless the appearance of unconformity is one of those fallacious appearances which the rocks of hills occasionally present when viewed from a distance.

The hills south of Píshín and Mand valley plain, for some distance east of Píshín, consist of rocks, similar, in character and strike, to those seen near the village.

The hills north of the plain are less compressed and hardened, but they likewise consist of shales and thin bands of sandstone, apparently identical with those forming the lower hills to the south. They are much contorted, and dip at high angles, or are vertical. In one place, north of Saadi, in Mand, the beds were found more crushed and hardened than usual, the shale becoming slaty and almost schistose, with numerous veins of carbonate of lime. In one place the shale was found broken up by a peculiar system of jointing into long acicular fragments, with rhomboidal sections resembling slate pencils. Some of the sandstones are massive, whilst a few beds are conglomeritic, the matrix being argillaceous, the pebbles principally sandstone. Some hard grits also are found. The sandstones occasionally have a ferruginous coating on the joint surfaces, causing them to assume a peculiarly dark appearance. One small hill, three or four miles east of Shairás Kúh, is so dark that it may, like the Siyáh Kúh, south of Píshín, consist of volcanic rock.

North of the Píshín and Mand valley there are in places masses of nummulitic limestone, irregularly associated with the shales and sandstone. The mode of occurrence of these masses is singular; they do not form regular strata, co-extensive with the adjoining beds, but are seen in immense blocks, many of them large hills, having their longer axes in the direction of the stratification, but isolated from each other. One such mass forms apparently the peak of Shairás Kúh, the highest hill in the range north of the Píshín plain. That the limestone is contemporaneous with the sandstone and shales is evident, but it appears in isolated fragments, looking like the remains of strata which have not yielded to compression like the softer sandstones and shales. Still there is very little to support this view. The masses of limestone, although numerous in particular localities, as in the valley about Húng, north-east of Shairás Kúh, where they form haycock-shaped peaks, compressed laterally, do not appear in regular bands, as they would if they were disconnected portions of one bed; whilst farther to the north-west, near Magas, in continuation, apparently, of the same strike, they form continuous ranges.

The limestone abounds in nummulites of several kinds. One form resembles *N. Lyelli*, another is a small species close to *N. Beaumonti* or *N. Biarritzensis*, and may be identical with *N. Vicaryi*; a third is perhaps *N. Leymeriei*, and an orbitolite (*O. Mantelli*) also occurs. Several smaller *Foraminifera* are also found in the rock, but no other fossils were observed.

There is no change in the general character of the rocks to the northward, except that the sandstones become more massive, and the shales form thicker beds north of Húng. The same shales and sandstones were met with throughout the course of the Nihing as far as Gishtigán, in Bampúsht. The limestones disappeared north and north-east of Húng, and only one or two isolated masses are seen beyond; one of these, near Bogan, contains *Alveolina elliptica*. The general strike continues nearly east and west, and the beds are vertical, or nearly so. This continued high dip over so large an area is a very remarkable feature in rocks of comparatively slight geological antiquity.

The Húng plain is less well marked than that of Mand and Píshín, but it is similar in character, being parallel in direction, and consisting in the same manner of a broad and level depression between two ranges of hills, running nearly east and west. It is, however, much more broken up by low ridges of rock, many of them, as already mentioned, consisting of limestone. A much better marked plain, having the same east and west extension, and similarly bounded by a higher range (Kúh Bampúsht) to the north, and low scattered ridges to the south, is traversed by the upper portion of the Nihing stream near Gishtigán. This plain extends to Diz on the east, and for a long distance beyond Irafshán on the west. Its general elevation near Gishtigán is 2800 to 3000 feet above the sea, whilst the Húng plain is about 2500, and that of Píshín and Mand 500 to 700. Near Gishtigán the expanse consists chiefly of thick beds of gravel, but ridges of sandstone crop out here and there.

Along the southern margin of the Bampúsht range, north of Gishtigán, is a low ridge, consisting of calcareous sandstone and conglomerate, the latter containing pebbles of sandstone, apparently derived from the nummulitic series. These rocks closely resemble the Makrán group, and may be contemporaneous, but the resemblance is very possibly due to both being derived from the waste of the nummulitic formations. The beds near Gishtigán merely occur as a fringe separating the rocks of the hills from the gravels of the Gishtigán plain. From Gishtigán they appear horizontal, but where traversed south of the Hinduwán pass, they dip south, usually at about 30° to 40°, but occasionally at higher angles, and in places they are vertical, their horizontality, as seen from Gishtigán, being apparently an exception. The plain gravels rest unconformably upon these beds, both on their northern and southern sides.

That this is a post-nummulitic deposit is clear. It may, however, be simply a sub-aërial accumulation of old date, like the great valley gravels resting upon it, but disturbed and upheaved.

The rocks of the Bampúsht range are shales and sandstones, precisely similar to the other nummulitics previously traversed. Near the axis of the range the strata are a little altered, the shales being much hardened and jointed, and breaking into spicular fragments in places. The beds are as usual vertical, or nearly so, and have the same east and west strike as elsewhere.

The Mashkíd valley extends east and west to the north of the Bampúsht range, forming yet another valley plain parallel to those of Gishtigán and Píshín. The stream which drains it issues from its eastern end to the northward, and, after a considerable course, is said to lose itself in the Sístán desert, but may perhaps run into the southern end of the Sístán lake. The elevation of the Mashkíd stream near Isfandak is 3250 feet, or 450 feet higher than Gishtigán. South of the stream the country consists of a confused mass of low ranges, much as in the upper Nihing valley, whilst, as in that valley, a long, gently-sloping plain of gravel extends north of the river as far as the mountains of the Siáneh Kúh, a range rising to an elevation of 5000 feet above the sea.

It is noteworthy that, in all these parallel plains, there is a great slope of gravel from the northern margin, none, or a very trifling one, from the south. The cause is probably that each range of hills rises to a greater height and more abruptly above the plain to the south than to the north, hence a greater accumulation of detritus along the southern slope of the range.

The rocks of the Siáneh Kúh, between Isfandak and Kalagán, are much more altered than those of any of the ranges farther south, the shale being converted into hard slate, some of it good roofing slate, with well-marked cleavage running about east and west, with a variation of about 10 degrees north or south of the general direction. The general strike of the rocks is the same, and the bedding frequently coincides with the cleavage, though the latter is often seen crossing the former. Some disturbance is evidently of posterior date to the cleavage, but, as a rule, the latter appears to have been contemporaneous with the upheaval of the rocks and their arrangement in their present, almost vertical, position. No change in the character of the formations takes place as far as Jálk, and precisely similar beds, alike in character, strike, and cleavage, are seen on the road between Kalagán and Kalpurekán, near Dízak.

North-east of the fort at Aibi-Kalagán is a small hill of porphyritic trachy-dolerite, containing crystals of felspar. It abuts abruptly against the slates.

In one spot, between Kalagán and Jálk, rather east of the main road, owing probably to jointing crossing the cleavage, the slate is split up so that it weathers into most extraordinary acicular fragments, a foot to eighteen inches long and not more than a quarter to half an inch in diameter. Similar phenomena were noted elsewhere, but the extent to which it is carried at this spot is remarkable.

Kalagán and Jálk are both close to the edge of the great desert plain which extends northwards from this portion of Balúchistán. At the lower end of the villages of Kalagán, near the edge of the desert, a sudden change takes place in the surface of the rocks. The steep abrupt and craggy ridges are replaced by gently rounded rises of low elevation, sloping away to the borders of the great desert plain. The same change is seen towards Jálk, but it is far less strongly marked. It certainly looks as if the lower hills near the edge of the desert had been rounded by marine (or lacustrine) denudation, and adds to the probability of the immense plain to the north and east having been the basin of a great inland sea.

The surface of the desert near its margin consists of a gravel of flat and subangular fragments of shale and sandstone, not rolled, and evidently washed from the hills. This, which is of recent origin, would conceal any lacustrine deposits which may occur. Farther out the surface of the desert is said to be sandy, and in places to be covered with blown sand.

2. *Jálk to Bampúr.*

From Kalagán and Jálk a complete change was made in the line of march. Hitherto the general direction from Báhú Kalát had been to the north. Hence it was due west as far as Bampúr, leading back into the Mashkíd valley at Kalpurekán, about twenty miles west-north-west of Isfandak.

The plain of the Mashkíd, near Kalpurekán, consists, as near Isfandak, of a long gentle slope of gravel from the hills on the north to the river, whilst to the south rocks form low ridges. From the plain, near Kalpurekán village, rise several small limestone hills, some of them abounding in nummulites, others in *Alveolina* (the spheroidal variety). In one case fragments of corals and shells were found associated with the *Foraminifera.* The bands of limestones begin here to be much better defined than to the southward; they can be traced a considerable distance (south of Dízak for some miles) and reappear on the same strike in other hills. One band is a conglomerate of hard sandstone and quartzite pebbles, in a calcareous matrix abounding in nummulites.

Three large hills arise from the plain south of Dízak; which appear as peaks when seen from the east, but are really ridges. The north-eastern consists of shale and sandstone, disposed synclinally, the others are of nummulitic limestone, and vertical. The strike of all is about E. 10° S. The range farthest to the westward is continued for many miles towards Sib. It turns slightly to the northward, and the band of limestone can be traced by the peculiar steep peaks which it forms far to the north-west in the direction of Paskúh.

Sib lies in one of the usual gravel and sand plains. To the south-west of this, the road crosses low ridges of shales and sandstones, much crushed as usual, but neither altered nor cleaved, and having a strike about north-west—south-east. These beds are apparently the continuation of those seen in Bampúsht, but the strike has curved to the north-west. Magas stands in a large gravel plain, through which rocks appear here and there. To the north-west there is a fine chain of hills called the Kúh-i-Birg rising to an elevation of 8000 feet above the sea (Magas being 4200), and consisting of nummulitic limestone associated with red shale. To the south-east a large hill called Moletán, evidently of limestone, is on the strike of the Kúh-i-Birg, and the same strike prolonged is very close to the Shairás Kúh and the limestone masses near Húng.

The rocks west of Magas, and those seen on the Ispidán torrent on the road to Aptar, are for the most part the ordinary shales and sandstones of the nummulitic series. The dip and strike vary constantly. About thirty miles from Magas granite boulders occur in large numbers in the Ispidán stream. They are apparently derived from a conglomerate which is seen in the bank of the torrent's bed. A little further west, a large hill composed of bands of limestone containing nummulites is passed to the north of the torrent.

For about eight miles east of Aptar the principal rock is volcanic. a kind of basalt, in places fine grained, in others coarsely crystalline. Sometimes masses of sandstone, much altered and hardened, appear enclosed in the igneous rock. This basalt is probably connected with the volcanic formations so largely developed northwards of Bampúr.

At Aptar the great plain is entered which extends far to the west beyond Bampúr. The drainage of the Magas plain appears to be to the Mashkíd, and thence to the Sístán desert, but a great descent is made to the Bampúr plain, the drainage of which is to the westward, and if it have an exit, it must be to the Persian Gulf. From Aptar to Fahraj or Pàhra the road leads over a gravel slope, the hills ten to fifteen miles north of Aptar, appearing flat-topped, as if composed of horizontal beds. North of Fahraj only low gravel rises are to be seen, and the road from Fahraj to Bampúr is over a sandy plain and along the banks of a considerable stream. The great plain west of Bampúr is of the same nature, well wooded with tamarisk and acacia trees in many parts, but covered in others with hills of blown sand. This plain, like so many others, may be the bed of an old inland sea, but the deposits have been covered up and concealed by sand and gravel brought down by streams and by surface wash. The hill on which the fort is built at Bampúr is said by Pottinger to be artificial, and it may be so in part, but it has much the appearance of a high bank of alluvium left undenuded, like similar rises to the north, which however are several miles distant. This rise is on a line of sand-hills which stretch east and west for a considerable distance, and possibly conceal other alluvial mounds.

3. *Bampúr to Bam.*

From Bampúr the direction of our route was again changed, and thence to Karmán, *viâ* Bam, a distance of nearly 300 miles, it led to the north-west. For ninety miles from Bampúr it traversed the great Bampúr plain, consisting entirely of alluvial formations. The lowest portion, at a distance from the hills, consists of sandy clay, a few small pebbles being found about the watercourses, but for many miles from the base of the hills the surface is formed entirely of gravel, composed of subangular and rounded fragments, chiefly of basalt and limestone, the size increasing as the hills are approached. These pebbles are evidently washed down by surface (rain) action, yet the slope is very gentle, and except near the hills considerably under 1°.

To the north of the plain are ranges of hills consisting, so far as can be judged by their appearance and the fragments of rock in the watercourses running from them, of volcanic rocks to the eastward near Basmán, and of (nummulitic?) sandstone and shale farther west. High above these ranges, at a distance of fifty miles, towers a great cone, Kúh-i-Basmán or Meh-Kúh; and another peak, about forty miles further, the Kúh-i-Daftán or Kúh-i-Naushádа[1] is still higher. Both of these peaks are doubtless dormant or extinct volcanoes. Smoke is said to issue from the Kúh-i-Naushádа, and sulphur is obtained from it[2]; but there appears to be no tradition in the country of these volcanoes having been active, and the period of their activity may have coincided with the time when the plain of Bampúr and the Narmashír desert were covered by inland seas.

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[1] Naushádа is the Persian for Sal-ammoniac. At the period of our journey the atmosphere was very misty, and we had only imperfect and occasional glimpses of these mountains.

[2] Pottinger, in his interesting and adventurous journey across Balúchistán and Persia

From Khúsrín, about ninety miles from Bampúr, the route passes for about seventy miles (sixty in a direct line) through hills entirely composed of volcanic rocks. At Khúsrín trachytes and trachytic ash occur in thick beds, either horizontal or rolling about at low angles with a general dip to the south. Basalts are intercalated, and, at one place, a conglomerate of waterworn pebbles was found interstratified. Above the trachytes and basalts there is a great thickness of horizontal ashy-looking beds, forming flat-topped hills, and apparently slightly unconformable to the massive trachytes and basalts below. To the northwards, the character of the rocks changes and basalts prevail, the beds becoming more and more ashy.

No sedimentary beds, except the conglomerate mentioned above, are seen on the road, although they must compose a considerable proportion of the hills a little to the eastward, because the streams coming from that direction abound in limestone pebbles. The limestone is unfossiliferous and may be cretaceous, like that north of Bam, to be presently mentioned.

The formations just described, all of which are well consolidated, occupy the country traversed for about fifty miles (or forty in a direct line); then, for fifteen to twenty miles, much looser beds are met with, chiefly ashes and vesicular blocks of comparatively recent origin, with a few outbursts of basalt, which are doubtless lava flows. These rocks, which are horizontal, must be of later origin than the trachytes to the south. One distinct small cone with a very gentle slope from its crater occurs close to the west of the road; it is somewhat worn, but its shape is very fairly preserved. A much higher hill to the east also looks like a volcano, but it is considerably broken down by denudation, and about four or five miles away to the west there is a well-marked crateriform hill, which has the appearance, from a distance, of a recent vent.

There can be but little doubt that the mass of volcanic formations, which, judging from the height of some of the hills, cannot be less than 3000 to 4000 feet thick, represents the accumulations of a lengthened period, and that some of them are comparatively recent.

in 1809, passed through Basmán and near the Kúh-i-Naushádа, which is briefly described in the published account of his 'Travels in Beloochistan and Sinde,' p. 180.

There is much probability that the various volcanic rocks which break through the nummulitics south of Píshín, near Kalagán, and at Aptar, together with the volcanoes of Basmán and the Kúh-i-Naushâda in the Sarhad, are portions of the same series of outbursts.

About twenty-five miles before reaching the northern boundary of the volcanic rocks, between two halting-places called Giránrig and Cháh-i-Kambar, the road traverses a valley, about five miles across, without any outlet. In the lowest portion is a nearly circular plain, about three miles in diameter, of hard clay, destitute of vegetation, and evidently a lake bed[1]. It is said, however, only to contain water immediately after rain. In the next valley to the northward, the first part traversed also appears to be depressed, but farther north there is drainage by a stream bed. These depressions must be due to local sinking of the surface, for the valleys themselves appear to have been formed by denudations, in part at least. The hollows are not craters, and the rocks around are well solidified ashes and lava flows, not the loose beds met with farther north.

The volcanic ranges form the watershed between the Bampúr and Narmashír plains, the latter being the higher (2500–3000 feet above the sea along its edge). The igneous rocks end at the Konar Nai, a river descending from a high range of mountains to the south-west, capped with snow in the middle of April. These mountains differ entirely in form from the volcanic rocks, and are doubtless metamorphic, for the river-bed is chiefly composed of pebbles of granite, epidote rock, quartzite, and other crystalline formations.

The plain of Narmashír, from Rígán to Bam, is the edge of a great desert extending, it is believed, to Khorassán. The great range just mentioned runs along the south-west margin of the plain, and continues to the north-west far beyond Bam. It was everywhere too distant from the road to be visited, but its composition is clearly shown by the metamorphic pebbles derived from it: they cover the plain in places, and occur in all the streams debouching into the Bam valley. The plain itself, or rather its south-western margin, which alone was examined, consists of sandy clay like most of the Persian plains, and is highly fertile when irrigated, but barren elsewhere.

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[1] For account of a lake at Dag-i-Farhád, between Cháh-i-Kambar and Girán Reg, see vol. i. p. 201.—*F. J. G.*

4. *Bam to Karmán.*

The town of Bam stands at the entrance of a broad valley, which leads from the low Narmashír plains to the highlands of Karmán, and along which the road ascends to the plateau. Bam is itself about 3500 feet above the sea, the ascent from the plain being over a very low slope of gravel. The valley is about twenty-five miles broad at Bam, and gradually contracts for thirty miles, till at Obárik, where it is about ten miles in breadth and 5500 feet above the sea at its lowest portion, it is abruptly terminated by a low range of hills.

This broad valley or valley plain consists of a portion in the centre sloping in the direction of the valley itself (north-west—south-east), and of a low uniform slope on each side, the inclination of which is, in each case, from the hills towards the centre of the valley. These lateral slopes are, in places, as much as ten miles in breadth, and their angle of inclination, which is singularly uniform, is of course very small, never exceeding about 2° to 3°. The whole of these slopes consist of gravel. There is in many places no stream down the centre of the valley, the streams which enter from the sides run along the slopes for long distances parallel to the direction of the valley, until their water is absorbed by the ground or carried off for irrigation channels. It is possible, however, that the tendency of the streams to run along the slope instead of seeking the lower portions of the valley, may be due to their waters having been diverted for ages for purposes of agriculture.

The hills north of the Bam valley from Bam to Obárik consist of volcanic rocks; trachyte, basalt and ash. A small ridge of these formations rises through the gravels just north-east of the fort at Bam, and consists of trachytic ash, in places finely bedded. The strike and dip vary, and the beds are in one place vertical. The volcanic ranges end in some small basaltic rises east of Obárik; a small fort near that village is built on a ridge of basaltic lava-flows striking north and south and dipping east. Just north of this the Tahrúd hills commence; they are of limestone.

The hills south of the Bam valley were too distant from the road for examination. Those lying due west of Bam and south-west of Dahárzin are evidently composed of sandstone and shale[1], as fragments of these rocks cover the slope descending into the valley from the base of the ranges. Some of the hills, too, look from a distance as if they consisted of limestone. The nearest range south-west of Bam may also consist of unaltered sedimentary beds, the great chain behind being of metamorphic rocks as already mentioned.

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[1] These beds are very possibly representatives of the shales and sandstones of Karmán believed to be cretaceous.

Close to Obárik, a range of limestone hills commences, which attains a considerable height, and extends nearly continuously to Karmán, not however in a straight line but curved. These hills near Obárik is known as the Tahrúd hills. The limestone of which they are composed is of cretaceous age; it is compact and varies in colour from light yellowish brown to grey, usually weathering with a pale brown surface; a few greenish shaley beds are interstratified. Near Obárik the limestone does not appear to be very fossiliferous, a few *Foraminifera*, an *Ostrea* and some obscure *Cardium*-like bivalves, alone being observed. At Khánah-Khátún, nine miles from Obárik, some specimens of Hippurites were found.

Opposite Obárik, and beyond a stream which here issued from the hilly country to the westward, there are some high cliffs of shales and conglomerates, very slightly consolidated, and to all appearance of comparatively recent origin. The shales are rather brightly coloured, greenish white, red, etc.; the conglomerates are mainly composed of limestone pebbles, evidently derived from the Tahrúd hills. The beds near the river are contorted and sometimes vertical, farther away they become more horizontal, and appear to pass up into the alluvial beds of the great plain to the northward, which extends to Ráyín. Despite this apparent passage it is probable that the disturbed deposits belong to an older formation, and they may represent the Makrán group of Balúchistán.

From Khánah-Khátún the road rises gradually to the surface of the plain already mentioned, the whole ascent of about 1000 feet being over beds of clays and gravels, the latter often cemented by carbonate of lime into a conglomerate. On the surface of the plain, which rises gradually towards Ráyín and the base of the Kúh Hazár, fragments of volcanic rocks abound derived from that mountain; some of these are as much as two feet in diameter.

The height of the Kúh Hazár above the sea is 14,600 feet, or about 7,000 feet above the town of Ráyín. The northern portion of the mountain up to an elevation of 12,000 feet consists entirely of volcanic rocks, ash beds and basalt, the former predominating, and it is probable that the whole mass consists of the same formations. It has, however, no appearance of being a volcanic cone, nor, so far as could be ascertained, do the rocks composing it dip away from any definite crater. It is entirely distinct from the main range to the southward.

In the ash beds some malachite occurs, and at the base of the mountain, near Ráyín, there is much calcareous tufa in horizontal beds, apparently deposited by springs, some of which are seen a short distance up the side of the mountain forming calcareous deposits. Large blocks of massive carbonate of lime of a slightly greenish tint, and apparently formed in stalagmitic masses, are found in the neighbourhood, and are used for ornamental purposes. A similar stone is said to be brought from Yezd and other places, and it is generally known in Persia as Yezd marble. It closely resembles the Egyptian stone known as oriental alabaster, except that the colour is greenish-white instead of yellow.

Hills emerge from the Ráyín plain a few miles north of the village, and rise into peaks of considerable height a little further west. They are chiefly composed of limestone, identical apparently with that of the Tahrúd hills. The rock composing the hill immediately north of Ráyín is white and sub-crystalline, and the dip about 45° to the north-east, but the next hill to the northward, a much larger mass, consists of grey and brown limestone, somewhat contorted and nearly vertical, with a general strike of west-north-west to north-west. The northern portion is of brown limestone dipping to the south-west; it contains small foraminifera. Below the limestone are sandstones and shales. This succession, limestones of great thickness resting upon sandstones and shales, can be traced to Karmán, north of which place the same beds apparently occur dipping in the reverse direction.

The road from Ráyín to Máhún and Karmán *viá* Hanaka crosses a pass at about 9000 feet above the sea. The whole of the country traversed in the neighbourhood of the pass, including the summit level itself, consists of coarse gravel filling up the hollows between the limestone and sandstone ranges. The surface is irregular, broken, and cut into by ravines, in which, and on the sides of the hills, the solid rocks crop out in places. As a rule the gravels are unstratified, but the great majority of the pebbles and boulders of which they are composed are thoroughly rolled. Occasionally the stratification is well marked, and in two places a little north of Hanaka the beds are disturbed and inclined, being in one spot even vertical for a short distance. A little beyond Hanaka the road descends to the sandy plain which extends to Karmán. Like other Persian plains, the central portion consists of sandy clay, a little blown sand covering it in places, whilst a long gentle slope of gravel extends for many miles from the base of the surrounding hills.

5. *Neighbourhood of Karmán.*

The plain extends for many miles south, west, and south-east of Karmán, but to the north hill-ranges approach close to the city. The nearest hill, on which stands a fort called Kala'h-i-Dukhtar, and which lies nearly due east of the present city, consists of very compact homogeneous limestone, pale pinkish[1] or greyish-white in colour, usually containing but few fossils, but occasionally exhibiting on its weathered surface sections of *Hippurites* and *Radiolites*. The strata are compact and of considerable thickness, weathering into rounded forms with a pale-brown colour on the surface. The limestone appears pure; it is not at all crystalline, but compact, with a waxy lustre and conchoidal fracture. It dips north at angles varying from 5° to 20°.

In many places this rock has the appearance of dipping under the dark-grey limestone beds forming the hills farther east. Very possibly there is a fault at the junction, for, more to the westward, east-north-east of Karmán, the pale-coloured limestone appears to rest upon the massive dark-coloured grey limestones. The latter here dip south-east; they are compact and massive, and contain in places Hippurites of various sizes in abundance; the bed is about 600 feet thick, and rests upon an equal thickness of very flaggy limestones of the same dark colour, but containing no Hippurites. The only fossils detected in these flaggy beds were a species of *Ostrea*, a *Cardium*-like bivalve, and an echinoderm resembling *Micraster*, all very ill preserved.

These are the lowest beds seen. North-east of Karmán, and four or five miles from the city, they are faulted against pale compact limestone, apparently identical with that of Kala'h-i-Dukhtar. Of this a considerable thickness, probably not less than 1000 feet, is seen. It dips under a very calcareous conglomerate, forming isolated hills about five to seven miles due north of Karmán. This conglomerate abounds in pebbles of Hippurite limestone, yet it appears to rest conformably on the pale-coloured beds. The junction, however, is concealed. The dip is north-west.

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[1] This is probably the same as the 'cream-coloured limestone' mentioned by Loftus, Q. J. G. S. 1855, pp. 285, etc.

Farther to the west a bed of whitish limestone appears to overlie the conglomerate, and it again is succeeded, in ascending order, by a considerable thickness of dark and pale grey limestones, containing corals and Hippurites, dipping north and north-east. All the beds above the massive pale limestone are seen in isolated hills dotted over the plain, and to the north of them an alluvial gravel flat five or six miles broad intervenes before the base of the higher ranges to the northward is reached. Of course this isolation of the hills renders the relations of the beds composing them somewhat obscure.

So far, however, as any conclusion can be drawn from the dips of the rocks in the different hills, all the beds hitherto described must dip under those forming the higher ranges to the northwards, the latter having generally a well-marked dip to the north. Along the southern base of these mountains are lower ranges much broken, three to four miles across, of a dark colour, and consisting of shale, sandstone, and occasional bands of dark grey limestone. North of these are two high-scarped ranges. The more northern of these, which must be twenty-five miles from Karmán, was not visited, but the southern range consists mainly of pale-coloured limestone, in places abounding in Hippurites, and at least 2000 feet thick. This bed is generally rather less homogeneous and waxy in appearance than the limestone exposed close to Karmán.

The sandstone of the lower ranges is usually massive and hard; red, brown, grey, or white in colour. The shales are very variable, many of them being dark olive, others red or yellow. They are impure, sandy, and at times calcareous. Limestones are of irregular occurrence, and fossils appear rare.

In a ravine about two miles east of a small village called Bazárgyan, at the southern base of the hills, is some carbonaceous shale, which has been taken for coal. It occurs in two beds (possibly three, the mode of occurrence being obscure and puzzling), exposed in the bed of the ravine, and again on the hill side. The upper bed appears to be fifteen to twenty feet above the lower, both are greatly decomposed, and very ill exposed, the rocks being much crushed and contorted, and dipping at high angles. The upper bed appears to be four or five feet thick; it is a very carbonaceous shale, containing much pyrites. The lower bed is about eighteen inches thick, more carbonaceous than the other, and it also contains pyrites in considerable quantities. At one place on the hill side there appear to be a few laminæ of coal, but no portion of the beds appears sufficiently pure to furnish useful fuel.

The carbonaceous shales are exposed on the top of a small anticlinal striking nearly east and west, the beds rolling over again to the westward. Above them are hard compact sandstones, white in colour; and then a few shaley beds, capped by limestone. The name of the place is Gaorí.

To the east of Karmán, following the course of a large open conduit, which, running east of Kala'h-i-Dukhtar, supplies the city with water, the hills fall back to the north, and a plain extends for some distance, running up to the northwards into a broad valley between the ranges. To the east of this valley are some limestone spurs, north of which again are low hills, stretching across from south-east to north-west, and consisting of conglomerate, alternating with volcanic ashes and basaltic lava. All dip to the south-west at high angles, in places being vertical. These beds only appear about ten miles from Karmán, and their relations to the limestones are obscure, but they appear to form part of the same series. The conglomerates, however, contain limestone and sandstone pebbles, and these beds may be a later formation.

Neglecting these, the probable relations of the beds near Karmán are the following. It appears probable that the massive Hippurite limestone resting on sandstones, shales, &c., north of Karmán, is identical with the limestone similarly superposed upon sandstones and shales between Ráyín and Máhún. In the former locality the series dips to the north, in the latter to the south, and in both cases it appears to overlie the beds seen close to Karmán. This may not be the case, the limestones at Karmán may be identical with those resting upon the sandstones and shales, but the other is the more probable view so far as can be inferred from the dips. If it be accepted, the following is a rough section of the rocks in this neighbourhood, in descending order, with their approximate thickness:—

	Feet.
1. Hippurite limestone, mostly pale-coloured	2000
2. Sandstones, shales, and dark limestones	3000
3. Dark and pale grey limestone with Hippurites	500

	Feet.
4. Pale limestone	?200
5. Conglomerate very calcareous	600
6. Pale limestone with Hippurites	1000
7. Dark compact limestone with ditto	600
8. Dark flaggy limestone, no Hippurites	600

The above is certainly not the whole section. That an immense thickness of the Hippurite limestone series occurs is proved by its forming hills rising 5000 and 6000 feet above the plain, as it does south of Máhún.

6. *Karmán to Shiráz.*

West of Karmán, the plain, at a distance of about twelve miles from the city, is divided into two broad valleys by a range of hills known as the Badamán Kúh, consisting apparently of the same rocks as those which form the hills north of Karmán. The south-eastern extremity of the spur consists of pale limestone, beneath which, on each side, sandstones and shales dip. The principal rock of the lower beds is a hard sandstone, frequently saccharoid, grey or white in colour, sometimes with brown spots, associated with dusky limestones, weathering brown on the exposed surface, and hard shales of a whitish colour. Other varieties of rock occur. If, as is probable, these are identical with the rocks of the hills to the north of Karmán, those beds must roll over to the southwards, west of the city, just as they apparently do to the south-east, near Hanaka and Máhún.

The plain in which Bághín stands, south of the Badamán Kúh, is a good example of the valley plains which occupy so large a portion of the Persian highlands. It runs nearly east and west, is, near Bághín, about thirteen miles across, and consists of a lateral slope of gravel on each side, and comparatively flat sandy grounds in the middle. The northern lateral slope is three miles broad, and its surface lies at an angle of 2°, or rather less. The central flat is six miles from side to side opposite Bághín; and along its southern margin is the bed of a stream, the water of which is usually diverted for irrigation. The southern lateral slope is between four and five miles broad, in which distance there is a rise of 450 feet, so that the inclination is a little more than 1°. The lower edges of these gravel slopes are sharply defined.

The hills south of the Bághín plain, traversed on the road from

Bághín to Mashísh, consist of volcanic rocks of the same type as those of the Kúh Hazár. Towards the Mashísh plain conglomerates and shales occur, like those seen north-north-east of Karmán, the conglomerates containing limestone and sandstone pebbles. Farther south still, and close to the plain of Mashísh, are some pale brown shaley sandstones, very irregular in dip and strike. All appear subordinate members of the volcanic series, but still the relations are not very clear, and it is quite possible that these sandstones and shales are cretaceous.

The valley of Mashísh is another broad expanse of alluvium, but it is at a higher level than the plain of Karmán (6700 feet), and, as appears to be commonly the case in the higher valley plains, the gravel-slopes at the side are less marked and of smaller extent. In the centre of the valley a stream runs in a well-marked bed, depressed below the general level. This also is the case at Bághín.

The range intervening between the Mashísh valley and the plain of Sarján consists also of volcanic rocks, largely covered with a great thickness of gravel, consisting of pebbles of volcanic rock in reddish-brown earth. The hills are high, the summit level near a caravanserai called Khán-i-súrkh, being about 8800 feet above the sea. Rocks only project here and there, and all the hills are rounded except one crag of trachyte, called Kúh-i-panj, which rises to an elevation of about 10,000 to 11,000 feet two or three miles west of the pass. The pass itself is on decomposed basalt.

After crossing the pass, the road descends very gradually to Sá'adatábád, on the edge of the great Sarján plain. The descent is chiefly over beds of whitish conglomerate, differing entirely from the gravels north of the range, and composed of pebbles and boulders of various volcanic rocks, all rounded in a matrix chiefly consisting of trachyte sand. Some of the boulders are of large size, six feet or even more in diameter, the larger blocks being disposed in layers. The beds are of great thickness, and a fine section of them is exposed on the banks of a stream down which the road passes. These conglomerates may be sub-aërial in origin: they dip at an angle of about 2° to the west or south-west, and have all the appearance of being a portion of an ancient lateral slope from the hills to the Sarján plain. The lower portion of the slope, which extends beyond the town of Sá'adatábád, is more gentle, and is apparently more recent, the streams running over it, and not cutting channels into it.

The hills which border the plain to the south-east of the villages of Sá'adatábád and Saidábád consist of crystalline limestone, whitish or dark grey in colour, associated with mica schist, talcose schist, quartzite, and gneiss. Many of the limestones are finely foliated, their foliation, as well as that of the schists and gneissose rocks, being clearly in the plains of bedding. The whole have, at a distance, precisely the appearance of sedimentary beds, and they so exactly resemble the Hippurite formations of Karmán in colour and mineral composition, that it appears highly probable that they are only the same beds altered. If this be the case, the change may very probably have been contemporaneous with the outbursts of volcanic rocks.

The plain of Sarján is between forty and fifty miles broad, and entirely composed, like other plains already mentioned, of alluvial deposits. It must extend for a far greater distance to the north-west, and it probably rises in that direction. The surface of the plain south-west of Saidábád descends with a scarcely perceptible slope, and consists of a very fine light brown loam, with the exception of the last eight miles, which are salt swamp. All the eastern part of this swamp is very marshy; the western part is covered with a hard sheet of salt, three or four inches thick at least. This ends but a few miles from the hills, the slope to which is very moderate, and, as usual, composed of gravel.

The hills traversed to the south-west of the Sarján plain consist chiefly of limestones, somewhat altered but not crystalline. The greater part are grey, some are brown, others pale-coloured, and although no fossils, except some obscure encrinite stems, were observed, the general character is that of the Karmán Hippurite beds. Some chloritic and talcose slates are associated with the limestones, which, towards Parpá, and sometimes in other places, exhibit traces of lamination. In one place, near Parpá, there is a bed of iron ore, apparently magnetic ore and hematite mixed, very pure, and four or five feet thick. It has evidently been dug into, but only to a small extent. Lead ore is said to be found in the neighbourhood.

The strike of the hills is about north 25° west, the dip very irregular, but generally to the eastward; near the salt plain it is nearly vertical.

From these hills there is a long slope to the south-west, composed of gravel, and terminating at a small salt plain close to the village of Katrú. In this plain, though on a smaller scale than in that of

Sarján, the broadest slope by far is on the north-east side, the smaller one to the south-west and in the neighbourhood of Katrú. This is not due to the greater height of the hills to the north-east, since those to the south-west are at least of equal height.

The range south-west of Katrú last referred to differs much in appearance and vegetation from all previously traversed. It consists chiefly of pale-coloured limestone, completely unaltered though frequently crushed and contorted. One large bed is formed of limestone pebbles cemented together. Dark-coloured beds are exceptional, but a small hill of dark grey limestone, much crushed and traversed by seams of calcite, occurs a mile west by north of Katrú, and similar rock is seen in places on the hills.

The general outline of the range is rounded, and the beds appear to dip at low angles. They are chiefly Hippuritic, but fragments of Nummulitic and Alveolina limestones were seen near Katrú, and again south-west of the range near Níríz, showing that Tertiary beds rest upon the cretaceous limestones in places, though none were noticed *in situ*.

In some of the ravines which traverse the hills doleritic rocks are seen in the beds of the streams. They have an altered appearance, and in some places resemble altered sedimentary rocks. In one instance a conglomerate of volcanic materials was observed. The relation of these beds to the limestones is obscure; they may be of the same series, but they probably belong to an older formation.

This same range stretches for about twenty-five miles past Níríz along the southern edge of the Níríz salt lake. Towards the lake it terminates in a flat-topped scarp, about 2000 feet high, entirely composed of pale cream-coloured limestone abounding in Hippurites. No Nummulitic rocks could be detected in the cliffs.

At the base of the cliffs, however, are some ferruginous shales and sandy beds of peculiar character, sometimes banded red and white, and often much decomposed. In some places they pass into a red and brown chert. They are usually turned on end, whilst the Hippuritic limestone is horizontal or nearly so. These red beds are continuous along the base of the Hippuritic limestone cliff as far as Khír (where the road followed turns away from the lake), the only change being that near Khír Nummulitic and Alveolina limestone is seen dipping north, resting upon the red shales in places, and forming spurs stretching out towards the lake. At first there appeared every probability of the red shales being lower in position than the cretaceous limestones, which had the appearance of resting unconformably on them, but the more probable view, strengthened by a very similar phenomenon at the lake of Shiráz, is that the line of cliffs is a line of fault, and that the red shales belong to either the Nummulitic or the Gypseous series. If they belong to the latter there must be a reversed dip, but some similar red shales seen near Sarvistán appeared subordinate to part at least of the Nummulitic formation. In the red shales some reptilian teeth, perhaps crocodilian, were obtained.

Some isolated hills in the plain west of Níriz consist of limestone resting on dolerite, as in the hills to the east. The limestone is traversed by vertical bands of chert.

The lake of Níriz (incorrectly called Bakhtigán on maps) is saturated with salt. It is of considerable size (about seventy miles long with an average breadth of not more than five or six miles), but very shallow. The plain on its border, where traversed, consists of soft light-coloured earth, similar to that forming the plains of Karmán, Sarján, &c. The hills on the north side of the lake are apparently of limestone, and seem to dip north, in the opposite direction to those near Khír.

The road followed left the Níriz lake at Khír, and turning southward passed through a gap in the hills, exposing sections of the rocks in ascending order. First, with some traces of the red shales at their base (or very probably faulted against them), are massive limestones. pale in colour and probably Hippuritic, they being in fact the beds which form the cliffs between Níriz and Khír. Upon them rest thin-bedded impure limestones, for the most part dusky grey in colour and having a strong bituminous smell when freshly broken or struck. These beds form a range running north of the valley of Rohnis. South of this valley is a high range of pale-coloured limestones, weathering with a peculiar whitish appearance. The relations of the bituminous limestones are not clear, but the pale limestones south of Rohnis are Tertiary and abound in *Nummulites* and *Alveolina* in places. From Rohnis the road enters a lateral valley between two ranges of Nummulitic beds, each dipping towards the valley, and these rocks assume the characteristic appearance of the Nummulitic limestones, being less compact and hard than the Hippuritic limestone, less homogeneous in texture, and much more rubbly, weathering into loose tabular blocks. They are much more fertile and better wooded than the cretaceous formations.

Further south-west another range of the same rocks rises to the south of Miánjangal, and a ridge south of Tangkirang looks as if composed of gravel. The road from Miánjangal to the westward ascends over a low pass composed of beds of red shale, grey and reddish sandstones and some limestones, dipping north, and apparently resting on the Nummulitic limestone to the southward. On a hill to the north these shales and sandstones are seen to be capped by massive limestone, which looks unconformable, but little dependence can be placed upon observations made from a distance. The red shales may be the same as those seen near Níríz, but they bear a considerable resemblance to the gypseous series of Loftus.

From the pass just mentioned the road descends to Sarvistán. The hills north of this village consist of nummulitic limestone, dipping to the south. South and west of Sarvistán is a plain extending to the lake of Shiráz, and the hills just mentioned are continued along the northern shore of the lake, till they join the range north of Shiráz itself. In the plain, north of the village of Khairábád, is an isolated hill of some height, consisting of a conglomerate of limestone pebbles, chiefly of Hippuritic limestone. This conglomerate is probably of nummulitic age, but it may be more recent. The pebbles are thoroughly rounded as if on a sea-beach.

The hills along the south-west side of Shiráz lake are all apparently of nummulitic limestone, and a cliff rises near the lake, composed of beds which dip to the south-west, away from the cliff. But close to the edge of the lake, a little west of Máhalá, rocks are seen contorted and dipping sharply over towards the lake. This looks much as if the cliff, like that of Níríz, were along a line of fault or fracture, and in that case it is probable that the hollow containing the lake is, in both cases, a recent depression.

7. *Shiráz to Isfahán.*

The rocks of the hills north of Shiráz[1] consist of pale limestone, containing Nummulites and other Foraminifera. The bedding is more distinct than is usually the case amongst the Hippuritic limestones, but the difference is scarcely sufficiently marked to enable the two formations to be distinguished by it at a distance. The beds usually roll about at low angles, the ranges having a general direction varying from about east and west to east 25° south—west 25° north, and the dip of one range is often the reverse of that in the next.

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[1] An attack of fever during the few days I remained at Shiráz prevented my visiting the hills to the west and south. I especially regret having been unable to examine the Gypseous series of Loftus, which are exposed at a few miles distance from Shiráz to the north-west.

At the same time the Gypseous series is represented on Loftus's map as occupying a considerable area east and south-east of Shiráz, which really consists of older formations. This country was not, I believe, visited by Loftus himself, and the boundaries on his map are, of course, not intended to be more than approximate.

The nummulitic limestone ends abruptly on the south side of the wide plains forming the western portion of the Mardasht, watered by the Bandamír (or the river so called on maps) and its branches. The detached hills and ranges which rise from the plain where the road crosses it between Shekábid and Máyín, on the summer route from Shiráz to Isfahán, are all of Hippuritic limestone, some of them abounding in Hippurites. The rocks dip at low angles, or are horizontal, and their mineral character is unmistakeably the same as that of the Karmán rocks, and far more massive than the nummulitic limestone near Shiráz [1].

The valleys in this neighbourhood contain running streams, and differ completely in character and shape from the valley plains of Karmán; there are no slopes of gravel at the side, and the flat ground of the valley, consisting of fine alluvial soil, extends to the base of the hills. Large springs gush out along the base of the abrupt cliffs in which the hills rise from the valley, and there can be but little doubt that these springs result from the drainage of the table-land above the hills, the water finding its way through fissures in the limestone.

Leaving the Bandamír valley at Máyín, the road ascends through a narrow gorge called Miàn Kothal, lying along the trough of a synclinal axis. Water abounds near the bottom, but the torrent bed is dry above. Passing Imámzádah Ismail, the road surmounts a ridge and descends to the plain of Rezábád at 7000 feet above the sea. The whole ascent is over limestones, apparently similar to the cretaceous rocks of Máyín, but becoming much altered and unfossiliferous.

Rezábád and Asupás, the next stage, are about twenty-four miles from each other, and both lie in a valley about eight to ten miles broad, the central portion of which is occupied by a large marsh. On each side are limestone ranges, that to the south-west being the range crossed between Imámzádah Ismáïl and Rezábád, and apparently consisting of limestone of cretaceous age: whilst the hills to the north-east are composed of dark grey limestone, apparently unfossiliferous. The latter rolls about at high angles without any definite general dip, and it may be cretaceous or older, but its age is unknown[1].

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[1] Mr. Loftus, Q. J. G. S. xi, p. 281, refers, though with some doubt, the rocks at Persepolis, a few miles east of the route followed, to the Nummulitics.

The road crosses this range, and then for nearly thirty miles traverses another broad grassy plain of sandy soil, at an elevation of about 1000 feet above the sea. Neither this plain nor that of Asupás has any broad gravel slope at the side. Beyond Ujún, ten or twelve miles beyond Kushkizard, the line of road crosses rounded hills of the drift-like gravel so prevalent at high elevations in Persia, and here consisting of limestone pebbles, whilst the hills north and north-east of Ujún itself are of limestone, brecciated in places, and probably identical with that west of the valley, traversed on the road from Asupás. Near Ujún the limestone becomes harder and more altered, and after a ruined caravanserai on the road-side is passed it is succeeded by dark-coloured foliated limestone, which continues to Dehgirdú.

Along the road from Dehgirdú to Yazdikhást, where the summer and winter roads from Shiráz to Isfahán unite, a distance of thirty miles, all the rocks are much altered and consist of slaty, almost schistose beds, alternating with limestone; these formations being greatly marked by a calcareous conglomerate in horizontal beds and gravel, the latter chiefly resulting from the disintegration of the conglomerate. Where the hard altered formations are first seen, five or six miles south of Dehgirdú, they are vertical, striking west 30° north. But little change except slight variation in the dip takes place for twelve or fourteen miles. Eight miles from Yazdikhást two small ranges of limestone are crossed with the same strike, but varying in dip. The road then enters the plain of Yazdikhást, another expanse of gravel, often cemented into a conglomerate, at an elevation of 7000 feet above the sea. A section of the beds forming the plain are exposed to a depth of about 100 feet by the stream which runs past Yazdikhást, the town itself standing on an isolated block of the conglomerate, with a deep channel cut by a branch of the stream on each side, so as to appear from a distance as if standing in the plain.

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[1] Loftus, who found similar beds extending from near Persepolis almost to Lake Urumiah, was also unable in most places to assign any definite age to it. Q. J. G. S. xi. pp. 289–291.

Two little hills in the plain north of Yazdikhást consist of unaltered shales and sandstone, capped by very dark limestone, abounding in hippurites. They dip west. It is of course uncertain whether the altered limestone of Dehgirdú, etc. be wholly or partly of cretaceous age, but the occurrence of the hippuritic limestone on both sides of the table-land tends to suggest the possibility of its being represented amongst the more crystalline beds of the intervening tract.

No other hills occur near the road as far as Maksúdbegí. The hills to the east of this village consist chiefly of dusky grey limestone, well stratified and unaltered. It abounds in fossils, but the only forms which could be distinctly recognised were some specimens of *Terebratula biplicata*, a characteristic cretaceous fossil. One hill in the plain, four or five miles north-west of Maksúdbegí, is probably volcanic: both its form and colour, the latter a mixture of black and reddish brown, being peculiar, and contrasting strongly with the limestone hills around. Time did not allow of a visit to it. The limestone hills are rather pale-brown on the weathered surfaces.

Near Maksúdbegí the broad plain of gravel, which extends from far beyond Yazdikhást, contracts, and at Kúmishah, a considerable town about fourteen miles farther, the hills on each side approach very closely. They here consist entirely of limestone in massive beds of light and dark colours alternating; the light-coloured limestone is in thicker and more homogeneous beds, and it weathers on the tops of hills into peculiar rounded knobs, looking more like trachyte or some forms of granitoid gneiss than limestone. Several of these rounded hillocks are scattered over the plain near Kúmishah. The darker beds are more distinctly stratified. These limestones closely resemble the Hippuritic strata of Karmán in character.

As is so frequently the case, these massive limestones are not very fossiliferous, and the organic remains which exist in them are as a rule ill-marked and difficult of recognition; sections of fossils are often seen, but the shells, etc. do not weather out on the exposed surface.

Similar limestones form all the ranges from Kúmishah to Isfahán. The road traverses plains of fine loam, or slopes of gravel near the base of the hills, and crosses one narrow limestone range, the Urchín hills, about twenty miles south of Isfahán. The rocks are dark-coloured limestones, nearly horizontal, and exhibiting sections of large bivalve shells (Ostrea and Chama?) with corals.

A bold mass of hills which rises just south of Julfa, the south-western suburb of Isfahán, consists of the same limestone as that forming the Kúmishah and Urchín hills, resting upon olive-grey shales and shaly sandstones closely resembling those which underlie similar limestone east of Karmán. The shales are much disturbed, rolling about at high angles, much higher apparently than the limestones above, yet no clear unconformity can be traced, and it appears as if the softer shale beds had been more squeezed and contorted than the massive overlying limestone. It is, however, possible that the two belong to distinct series.

Fragments of *Alveolina* limestone occur in the bed of the Zaindarud, showing that nummulitic beds exist at no great distance west of Isfahán, but the limestones near the city appeared all to belong to the cretaceous series[1].

The plains near Isfahán resemble those near Karmán much more than they do the valleys of Fárs, but the gravel slopes at the sides are smaller near Karmán. These slopes attain a greater development again to the northward between Isfahán and Tehrán.

8. *Isfahán to Tehrán.*

But few geological observations were made on this part of the journey, except near Kohrúd. The season was the latter end of July, the hottest part of the year, and the greater part of the distance was rapidly traversed by post, a considerable portion of it at night.

As far as near Murchikar, thirty-five miles from Isfahán, the road is mostly over a level plain of fine light-coloured alluvial soil, with scattered hills, one small range of which is traversed. From Murchikar to Bideshk, nearly twenty miles, there is a gradual ascent over a very long well-marked gravel slope, leading from the Isfahán plain almost to the summit of the range of hills on which Soh and Kohrúd stand, and which bounds the salt desert to the south-west. The ascent from Murchikar to Bideshk must be nearly 2000 feet.

The hills between Murchikar and Soh are of dark impure limestone, much crushed and veined, resembling that near Dehgirdú. Near Soh it is mixed with olive shales.

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[1] Loftus represents the rocks south-west of Isfahán as Nummulitic on his map, but I can find no reference to them in the Memoir.

About Soh some of the gravel beds are cemented into a conglomerate, and a superficial calcareous deposit forms a firm limestone on the hill east of the caravanserai. The road from Soh to Kohrúd passes for some distance over gravels and conglomerates, and then traverses volcanic formations mixed with sedimentary beds; grey shale, decomposing into whitish clay, limestones, conglomerates, sandstones, etc. In many places the greater part of the formation is sedimentary, the volcanic portion (lava-flows and ash-beds) being of inferior thickness. Some of the limestones are massive and of decidedly cretaceous character; they are interstratified with the basalts and ash-beds in a manner which shows that all must be of the same age.

At the pass before reaching Kohrúd, the limestones and associated volcanic formations rest upon granite. To all appearance the two series are quite unconformable. The granite passes into gneissose and schistose rocks between Kohrúd and Gabrabád, and is apparently metamorphic, and not intrusive.

The Kohrúd range ends its north-east side in a bold scarp facing the great plain marked in maps as the salt desert. South-east of Kohrúd, for a considerable distance, the face of this scarp appears to consist of metamorphic rocks, but to the north-west the only rocks seen for many miles are limestones and shales. At the caravanserai of Gabrabád, close to the base of the hills, these beds are unaltered, and they precisely resemble those of Julfa. They are vertical, and strike east and west. West of Kashán there are some rocks which, at a distance, look like metamorphics.

One of the finest and best-marked gravel slopes seen in Persia extends along the base of the Kohrúd range, near Kashán; it must be ten or twelve miles broad, and the difference in elevation above the sea between the bottom of the slope and its upper limit at the foot of the hills is about 2250 feet by a rough aneroid measurement. The town of Kashán is at the lower edge of the slope, close to a plain of the usual fine light-coloured loam, which stretches away to the horizon, being part of the great salt desert of Northern Persia. Very large blocks of granite, two or three feet in diameter, are found on the slope three or four miles from the base of the hills, having apparently been carried down this slight incline by streams.

From Kashán to Tehrán, nearly 150 miles, the road lies either along the edge of the great desert plain, or over spurs running out into it. All of the rocks, so far as they could be observed during a rapid journey on post-horses, were so similar that it is highly probable they all belong to one series, and that identical with the rocks occurring between Soh and Kohrúd. They are a remarkable mixture of sedimentary and volcanic formations; limestones, sandstones, and shales alternating with basaltic lava-flows and beds of ash. None of the volcanic formations have the appearance of being recent, all seeming to be associated with the sedimentary beds as if they were contemporaneous.

Between Sinsin and Shoráb, thirty miles north of Kashán, are some hills of shales, coloured in a rich and peculiar manner, and limestone volcanic beds (basalts and ashes) are associated. Similar rocks continue nearly to Kum. Thence to Púl-i-dalák the road traverses undulating grounds and gravel hills. The low ranges between Púl-i-dalák and the salt marsh south of Hauz-i-súltán were passed in the night, but they appeared chiefly volcanic. The hilly country north of Hauz-i-súltán, extending as far as Kináragird, is composed of limestones, shales, and sandstones, with volcanic rocks intermixed; whilst the range north of Kináragird, lying about twenty miles south of Tehrán, is entirely volcanic. North of this range is an alluvial plain extending to Tehrán.

Some hills in the plain east of Tehrán are said to consist of limestone. Blocks of limestone brought from them for use in building the English Mission contained hippurites in abundance. This strengthens the probability of all the limestones and associated rocks from Isfahán to Tehrán being cretaceous, since the character of the limestones in general is very similar to that of the hippuritic beds of Southern Persia.

9. *Elburz mountains, north of Tehrán.*

Whilst detained at Tehrán, I took the opportunity of visiting part of the Elburz mountains, immediately north of the Persian capital, examining some localities at which coal had been discovered, and collecting specimens of the fauna. The rocks of the Elburz appear quite different from those of the other parts of Persia examined. The geology is far too intricate to be made out by a mere traverse, and I have not attempted to indicate it on the map; all that I can do is to describe what was seen on the route followed. Leaving Gulhak, the summer residence of the British Mission, six miles north of Tehrán, I went east for a few miles and then entered the mountains by the valley of the Jáj Rúd. After examining the coal seam near Rútah, I crossed from the Jáj Rúd to the Lúra or Karij, the next river-valley to the westward, and spent two or three days in the Lúra valley. I then marched north across the dividing ridge of the Elburz to the village of Anán in Mazandarán, whence, after one day's halt, I returned to Tehrán.

Tehrán is about ten miles from the base of the Elburz, the intervening distance being occupied by one of the immense gravel slopes so often noticed in Persia. Some of the king's palaces, the summer residences of the different European Missions, and of many of the Persians themselves are at various elevations upon this slope, the base of which at Tehrán is 3000 feet above the sea, whilst its upper limit north of Gulhak, where the rocks of the mountains crop out, must be nearly 6500 feet.

The rocks near the base of the range are chiefly volcanic, diorite, or a closely allied formation, being common. It is not clear whether the igneous rocks are intrusive or interstratified, but as they appear chiefly confined to the southern scarp of the hills it is highly probable that they are of intrusive origin. The rocks too in their neighbourhood appear harder than elsewhere.

All the upper portion of the high ridge north of Tehrán, forming the southern scarp of the range, and rising due north of the city to an elevation of upwards of 11,000 feet, is composed of shales and fine sandstones, for the most part quite unaltered except near the volcanic masses. The shales are mostly grey or greenish grey, not black. A few bands of hard sandstone of various colours are met with, and a little limestone. No fossils were observed. The rocks are much disturbed near the Jáj Rúd, but much less to the west.

As the valley of the Jáj Rúd is cut through the ridge just described, it is evident that the lower portion of the ravine in which the river flows must expose a section of the beds forming the ridge. The lower portion of the deep glen of the Karij river doubtless exposes a similar section about thirty-five to forty miles farther west, but this was not visited. The coal locality near Rútah lies at some distance to the east of the Jáj Rúd, in the hills drained by a small tributary of that river. To proceed to Rútah, the Jáj Rúd valley is quitted at a village called Ushán, about ten miles from the point where the river leaves the hills, and the road runs for five or six miles to the north-east along the valley of a tributary, it then turns north up the valley of a still smaller stream, on which the village of Rútah is situated. The glen becomes very narrow beyond the village, and ascends rapidly. The coal seam is exposed on the face of a hill, four or five miles north of Rútah, at an elevation of about 9000 feet above the sea.

Up the small stream near Rútah there is a great quantity of red sandstone, fine in texture, hard and compact, succeeded by argillaceous sandstone or hard massive shale of the same colour. Just beyond the village of Rútah, limestones, (? carboniferous,) dark-coloured at first, but afterwards lighter, come in, whether resting on the sandstones or faulted against them is not clear; the limestones are turned on end where they first appear and are much broken and contorted throughout. The coal seam is associated with shales and sandstones, but the relation of these beds to the limestones is doubtful, because a fault appears to intervene running east and west along the base of the spur on which the coal crops out. No fossils were found in the shales, and the age of the coal is consequently uncertain.

The only seam of coal which has been at all worked was so ill-exposed through the outcrop being concealed, and the small opening made having fallen in, that its thickness could not be accurately determined: however it is at least three feet thick, probably more. It dips at a high angle, about 60°, to the north, and is much crushed. The outcrop can be traced for 150 to 200 yards at least, and probably much farther. About 200 feet lower there is the outcrop of another seam, and there are other seams either of carbonaceous shale or coal exposed on the opposite hill.

The rocks exposed throughout the upper part of the Jáj Rúd valley are shales and sandstones, apparently similar to those of the range immediately north of Tehrán. The most conspicuous and abundant formation is a very hard green shale. The same beds occur in the Lúra valley, mixed with some reddish shales and sandstone of various kinds. The beds are much disturbed and the strike and dip irregular.

Ascending to the dividing ridge between the streams running south and those flowing north to the Caspian beyond the village of Sar-i-gach, the road passes for about a quarter of a mile over diorite[1], probably an intrusive mass injected into a line of fault; beyond this vertical black shales come in, striking nearly east and west. These shales form the crest of the watershed. They are quite unaltered, but no fossils were observed in them. Descending on the north side of the range, one or two small seams of coal are exposed in this shale by the road-side, but none were seen more than a foot thick. A few thin bands of limestone are interstratified with the shales.

Some large masses of gypsum occur both north and south of the pass, apparently interstratified, but this is not certain.

Some distance before reaching the village of Anán, massive limestones come in and occupy the whole valley below Anán for several miles; indeed as far as it was examined. There can be no question about the age of the lower portion, as *Productus giganteus*, one of the most characteristic carboniferous limestone fossils, was found abundantly in it in one place, and probably all the limestone may be of the same age. Altogether the thickness exposed on the hill-sides about Anán cannot be much less than 5000 feet, but some portion of the mass consists of carbonaceous shales, and occasional beds of red sandstone and shales are met with.

Where the limestones abut against the shales south of Anán the boundary is a fault. Apparently the limestones are lower in the section than the shales, but as some shales are interstratified with the limestones, and some thin bands of limestone with the shales, it is not improbable that all belong to one series. The few fossils obtained from a bed in the shales near Anán are, as I am assured by Mr. Etheridge, who has examined them, decidedly Devonian in aspect. They comprise the following:—

Streptorhynchus crenistria.
Spirifer allied to *S. disjuncta*.
Spiriferina allied to *S. cristata*.
Retepora, two species, one allied to *R. laxa*, the other to *R. flustriformis*.

It thus appears highly probable that there is in the Elburz a mixture of Devonian and Carboniferous forms, as has been indicated elsewhere. The coal of Rútah and the small seams near Anán may be of carboniferous age, but as no fossils were found associated, this is doubtful[1]. As will be presently shown, the coal of Hír, west of Tehrán, is Oolitic. The age of the hard green shales and associated beds which occupy so large an area in the Jáj Rúd and Lúra valleys is undetermined, no fossils having been observed in them.

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[1] This rock, and that observed on the southern scarp of the Elburz, has the appearance of diorite, but as unfortunately no specimens were brought away for examination, I may be mistaken in believing it to be hornblendic, and it may be a form of dolerite.

10. *Tehrán to Resht.*

The notes on this section are also very fragmentary, the roads as far as Kazvín being entirely over alluvial formations, and the hills which lie to the north of the route having only been visited in one spot, near Hír; whilst from Kazvín to Resht the relations of the rocks appear too complicated to be determined without further examination, and the beds being unfamiliar required longer study for determination than could be given during a rapid journey.

There is very little ascent from Tehrán to Kazvín, the road traversing a great plain lying along the southern edge of the Elburz. The gravel slope continues, but it is less well marked, and of smaller extent than at Tehrán, a change doubtless connected with the diminished height of the mountain range from the waste of which it is derived. The hills to the south of the plain are too distant for any idea of their composition to be formed.

As already mentioned, the Elburz was visited at the village of Hír, about forty miles north-west of Tehrán. The rocks here are pale-brown and greenish-grey shales and sandstones, the latter not massive. The coal locality is rather more than a mile from Hír, and the mineral is exposed on the slopes of low hills. There are two seams, both of which have been worked in a very irregular manner by extremely small galleries driven in from the outcrop. The dip is high, 50° to 60°, and the direction varies, the beds rolling about. The lower seam is about a foot thick, the upper seam is rather thicker, but it appears more mixed with shale, and has been less worked. The coal is of excellent quality, bright and clean.

With the seams pale-coloured shales and sandstones in thin beds are associated, and a little lower down in the beds there is a massive band of limestone, also of a light colour. In the shales immediately associated with the coal Pterophyllum and Palæozamia abound, with traces of conifers, proving that the rocks are Oolitic. They do not at all resemble the beds associated with coal near Rútah, or the carbonaceous shales seen south of Anán.

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[1] I am indebted to Mr. Newton of the Geological Survey of Great Britain for sections of these coals, which he made for me in hopes that they might shew some traces of structure. Unfortunately this proves not to be the case; the specimens of coal from Rútah appear very impure, but they were hurriedly taken and may not be fair samples.

This locality is very easy of access, and an excellent road might be made to the plain without the slightest difficulty. This gives it great advantages over the more eastern locality, but the coal near Rútah appears (so far as can be judged from mere inspection) of better quality, and the seam is much thicker. The locality, however, is very difficult of access, and at so great an elevation that it must be covered with snow for half the year.

The rocks forming the southern edge of the hills appear similar to those seen at Hír till near Kazvín, where they are replaced by volcanic beds, which are well seen on the roads between Kazvín and Káhzán. They are quite unlike the rocks in the Elburz near Tehrán, and more resemble some of those occurring in Southern Persia, being a great series of basalts and ash-beds. They roll about at low angles. A fine section is seen on the descent of nearly 4000 feet to Pachapar, in the valley of the Safíd Rúd, which is entirely over bedded traps, all, or almost all, basaltic.

Near Manjíl these volcanic beds are replaced by sandstones, limestones, and conglomerates, with black and dark greenish shale dipping to the south. These beds are said to be of lower secondary age, and some coal is found in them. The prevalent beds are black shale and conglomerate, containing white quartz pebbles. The dips become lower near Rúdbár, six miles beyond which village the bedded traps recur, with a high north-east dip, apparently resting upon the carbonaceous shale. The traps occur along the road, here running due north for about ten miles. Five miles beyond Rústamábád calcareous shales, vertical and striking a little north of west, occur, and then soft, dull olive shale. Beyond this very little rock is seen, the whole country being covered by forest; and a few miles further, near Imámzádah Hashim, the road runs on to the flat alluvial plain which extends to the Caspian.

ITINERARY.

List of halting-places, and distances travelled by Major St. John and Mr. Blanford, between Gwádar and Shíráz.

DATE, 1872.	HALTING-PLACE.	DISTANCE APART.	DISTANCE FROM GWADAR.
January 22	Ankora	13	13
" 23	Falari	13.5	26.5
" 24	Siroki	15	41.5
" 27	Samán Torrent	12.5	54
" 30	Roghán Torrent	15.2	69.2
" 31	Bahú Kalát	11.3	80.5
February 4	Camp on Bahú River	12.2	92.7
" 5	Camp near Kastag	18.8	111.5
" 6	Píshín	11.2	122.7
" 12	Der-i-dúr Torrent	3.9	126.6
" 13	Sa'adi	11.7	138.3
" 14	Kalari	5.5	143.8
" 16	Nihing River	6.8	150.6
" 17	Mouth of Hamzai Torrent	9.2	159.8
" 18	Camp in Hamzai Torrent	9.1	168.9
" 19	Camp near Húng	11.1	180
" 21	Camp	11.7	191.7
" 22	Mouth of Shahri River	11.5	203.2
" 23	Camp in bed of Nihing	7.7	210.9
" 24	Camp in bed of Nihing	14.6	225.5
" 25	Camp in bed of Nihing	18	243.5
" 26	Gishtigán	10.6	254.1
March 2	Camp	2.4	256.5
" 3	Hindúán Torrent	9.6	266.1
" 4	Camp	6.3	273.4
" 5	Táshkrík	7.5	279.9
" 6	Kodáni Torrent	9.1	289
" 8	Mashkíd River, near Isfandak	16.4	305.4
" 9	Bonsir Pass	17.1	322.5
" 10	Aibi	11.6	334.1
" 12	Kalagán (near Laji)	5.7	339.8
" 13	Jálk	11.9	351.7
" 18	Kalagán (near Laji)	11.9	363.6
" 19	Kal-i-Balúch	10	373.6
" 20	Kalpúrakán	20.6	394.2
" 21	Dizak	12.8	407
" 25	Abpatán	20.3	427.3
" 26	Surán	6.8	434.1
" 27	Khaur Chahárúkán	12	446.1
" 28	Magas	15.6	461.7
" 29	Sar-i-Púhra	13.6	475.3
" 30	Ispidán	20.9	496.2
" 31	Aptar	25.7	521.9

DATE, 1872.	HALTING-PLACE.	DISTANCE APART.	DISTANCE FROM GWADAR.
April 1	Puhra	12.7	534.6
„ 2	Bampúr	15.6	550.2
„ 8	Kúchehgardán	16.4	566.6
„ 9	Cháhshúr	22.1	588.7
„ 10	Kalánzáo	26	614.7
„ 11	Ladi	12	626.7
„ 12	Khúsrín	15.7	642.4
„ 13	Gwám-i-Talab-Khání	14.8	657.2
„ 14	Gírán-ríg	14.9	672.1
„ 15	Cháhkambar	23	695.1
„ 16	Konarnai River	13.7	708.8
„ 17	Rígán	16	724.8
„ 18	Búrj-i-Muhammad Khán	15.9	740.7
„ 19	Jamálí	16.9	757.6
„ 20	Búrábád	19	776.6
„ 21	Bam	3.7	780.3
„ 24	Bídarán	6.7	787
„ 25	Dahárzin	9.6	796.6
„ 26	Abárík	17.2	813.8
„ 27	Tahrúd Caravanserai	9.3	823.1
„ 28	Ráyín	29.8	852.9
May 2	Hanaka	22.8	875.7
„ 3	Mahún	15.2	890.9
„ 4	Karmán	22	912.9
„ 17	Bághín	18	930.9
„ 19	Mashish	25.5	956.4
„ 21	Khán-i-surkh	28.8	985.2
„ 22	Sa'ádatábád	27	1012.2
„ 24	Sa'idábád	16.3	1028.5
„ 28	Tarábád	12	1040.5
„ 29	Khairábád	13.7	1054.2
„ 30	Parpá	20.7	1074.9
„ 31	Kútrú	22.5	1097.4
June 1	Nírís	28.4	1125.9
„ 3	Camp on shore of lake	12	1137.9
„ 4	Rohnis	27.9	1165.8
„ 5	Tang-i-karim	11.5	1177.3
„ 6	Sarvistán	27	1204.3
„ 7	Khairábád	13.5	1217.8
„ 8	Mahálú	14.3	1232.1
„ 9	Shíráz	24	1256

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